

LMU

LUDWIG-
MAXIMILIANS-
UNIVERSITÄT
MÜNCHEN

OPEN PUBLISHING
IN THE HUMANITIES

UB



INES GHALLEB

The Interdisciplinary Mind:

Modes of Evolution in Richard Powers' Novels

OLMS

Ines Ghaleb

The Interdisciplinary Mind

Modes of Evolution in Richard Powers' Novels

Open Publishing in the Humanities

The publication series Open Publishing in the Humanities (OPH) supports the publication of selected theses submitted in the humanities and social sciences. This support package from LMU is designed to strengthen the Open Access principle among young researchers in the humanities and social sciences and is aimed specifically at those young scholars who have yet to publish their theses and who are also particularly research oriented. The OPH publication series is under the editorial management of Prof. Dr Hubertus Kohle and Prof. Dr Thomas Krefeld.

The University Library of the LMU will publish selected theses submitted by outstanding junior LMU researchers in the humanities and social sciences both on Open Access and in print.

<https://oph.ub.uni-muenchen.de>

The Interdisciplinary Mind

Modes of Evolution in Richard Powers' Novels

by
Ines Ghaleb

Published in cooperation with the **publishing house Georg Olms** and the **University Library of Ludwig-Maximilians-Universität München**

Funded by Ludwig-Maximilians-Universität München

Georg Olms Verlag AG
Hagentorwall 7
D-31134 Hildesheim
<https://www.olms.de>

Text © Ines Ghalleb 2021

This work is licensed under the Creative Commons Attribution BY 4.0 (<http://creativecommons.org/licenses/by/4.0/>). Graphics, tables and figures may have different licenses. These will have been identified in the caption to relevant content.

First published 2021

Accepted as dissertation at Ludwig-Maximilians-Universität München 2020

Cover image: collage by Michael Cerny and Ines Ghalleb based on open-source photographs from <https://pixabay.com> and <https://www.pexels.com>

Bibliographic information of the German National Library

The German National Library lists the title in the German National Bibliography; to view detailed bibliographic information, visit <http://dnb.d-nb.de>

For a free, open access version of this book visit
<http://nbn-resolving.de/urn:nbn:de:bvb:19-277877>
<https://doi.org/10.5282/oph.18>

ISBN 978-3-487-16069-6

Contents

List of Figures	XI
Acknowledgments	XIII
Summary	XV
Introduction.....	1
Part I Artificial Evolution: The Pursuit of Enhancement.....	17
Chapter 1 Genomic Network in <i>Generosity: An Enhancement</i>	21
1.1 Emotions in Genes: How Programmed Are We?	25
1.2 Enhancement: Gene Editing or <i>How Programmable Are We?</i>	29
1.2.1 Use of Negative Emotions	29
1.2.2 Interconnections of Emotions	31
1.3 The Enhancement Paradox.....	33
1.3.1 Futuristic Enhancement	33
1.3.2 The Debate of Indecision	38
1.4 Editing is the New Writing	44
Chapter 2 Scientific Evolution: Brain Plasticity in <i>The Echo Maker</i> ... 49	
2.1 Cerebral Interventions and Evolution	52
2.2 Paranoia and the <i>Doppelgänger</i> Narrative.....	58
2.3 Affective Perception: Neurological Understanding.....	62
2.4 Cognitive Mapping and Brain Malleability	64
2.5 Mind <i>Simulacrum</i>	68
Chapter 3 Technological Evolution in <i>Galatea 2.2</i>	73
3.1 Machine Learning: A Quest for Human Brain Mimesis.....	75
3.1.1 Upgrading AI.....	75
3.1.2 Linguistic Aptitude.....	84
3.2 Mimesis Paradox: Evolving <i>through</i> or <i>beyond</i> Mimesis?.....	97
3.3 Artificial Intelligence: Interdisciplinary Plasticity	106

Part II Civilizational Evolution: Restraint and Variations	113
Chapter 4 Clashes and Hybridity.....	119
4.1 Micro-demarkations	119
4.2 Neighboring Countries	127
Chapter 5 The Virtuality of War	133
5.1 The Spectacular.....	133
5.2 Smart and Precise	138
5.3 Blackmail and Shock.....	143
5.4 The Containment-Contagion Paradox	147
5.5 Antiaesthetic	148
Part III Artistic Evolution: <i>Iconoclash</i> through Interdisciplinary Thought	153
Chapter 6 Literary-Technological Iconoclash:	
CAVE-Narrative Structure.....	169
6.1 Image Construction in Art/Technology.....	170
6.1.1 Image Mutation.....	170
6.1.2 Pixilation.....	173
6.1.3 Art Digitalization	175
6.2 Stereoscopic Narrative Construction.....	177
6.3 Narrative Immersion and Intrusion.....	183
6.4 Narrating in Full Scale.....	186
6.5 Narrating in Sync.....	190
6.6 Plowing Algorithms in the Dark.....	193
Chapter 7 Architectural–Literary Iconoclash:	
Virtual Hagia Sophia	195
7.1 Quicksand Prototyping	201
7.2 Superimposed Narrative Structures	208
7.3 Architectural Volatility: Evolution of Optics and Acoustics.....	210
7.3.1 The Evolution of Optics	211
7.3.2 Artificial Reflections	213
7.3.3 Artificial Reverberations	214
7.3.4 Liquescent Narrative Structure.....	217

Chapter 8 Religious-Literary Iconoclash	229
8.1 Inimitability: The Imitation Challenge	230
8.2 Caves in Islamic Scripture	232
8.3 Quantifying the Flux of Time	234
8.4 Probing Qur'anic Aesthetics	235
8.5 Conversational Dimensions	239
 Chapter 9 The Novel as Crafted by Richard Powers	 247
9.1 Cross-cultural Elements	251
9.2 Elements of Interdisciplinarity	256
9.3 The Urge: What is Next?	260
9.4 The Novel as Crafted by Richard Powers	263
 Conclusion	 267
 Bibliography	 273
 Appendix: A conversation with Richard Powers	 291

To

*My Father, Ridha Ghaleb
My Mother, Cherifa Allani*

✧

My Husband, Michael Cerny

∞

List of Figures

Fig. 1	Dougga (Left), Tunisia, 2019 ©Michael Cerny; Carthage (Right), Tunisia, 2019 ©Ines Ghaleb, both: CC-BY 4.0	123
Fig. 2	Sun Yuan and Peng Yu, “Can’t Help Myself,” Venice Biennale “May You Live in Interesting Times,” Giardini Central Exhibition, Venice, 2019 ©Sun Yuan & Peng Yu Studio provide.....	150
Fig. 3	Recycle Group, Andrey Blokhin and Georgy Kuznetsov, “Blocked Content,” Venice Art Biennale “Viva Arte Viva,” Russian Pavilion, Giardini, Venice, 2017 ©Recycle Group.....	167
Fig. 4	From Patrick Aventurier, “Détail du Panneau des Lions,” Chauvet, Ardèche, 2015 ©Patrick Aventurier—Caverne du Pont d’Arc; Schematic Illustration of the Wall Contour	172
Fig. 5	The Interdisciplinary Novel: Multiplanar, Interconnected, Exponential.....	263
Fig. 6	A Conversation with Richard Powers, 2014, Urbana-Champaign, Illinois ©Richard Powers.....	291

Acknowledgments

The shaping of this book has developed from my doctoral research at the Graduate School Language and Literature (GS L&L)—Class of Literature—the University of Munich, Germany. I would like to express profound gratitude to my primary supervisor, Prof. Dr. Klaus Benesch, for his outstanding dedication, offering constant mentorship and support. I am thankful for the time he took to discuss different ideas and to point out controversial matters. I am equally indebted to my second supervisor, Prof. Dr. Tobias Döring, for his invaluable feedback and support. I cherish their enthusiasm for the topic. I am also thankful to my examiner, Prof. Dr. Christof Decker. I wholeheartedly thank the professors of the GS L&L for their invaluable feedback during the colloquia, and I thank Dr. Markus Wiefarn for his guidance on crucial administrative matters.

This project was fully funded by the German Academic Exchange Service (DAAD) Graduate School Scholarship Program (2016–2020) and the DAAD Completion Grant (2020). The publication is fully funded by the LMU *Open Publishing in the Humanities* as part of the initiative to promote excellent young academics. I am thankful for their great services as well as their continuous support. I would like to thank Dr. Claudie Paye, Dr. Wendy Kneissl, Annerose Wahl and Isabella Grill.

I am thankful to my colleagues at the GS L&L and to my colleagues at the Amerika-Institute LMU. Special thanks go to Mark Olival-Bartley, Carina Breidenbach, Helen Baur, Bryan Banker, Katharina Simon, Vibeke Johnson, and Inés Hamdi for their moral support, tips, and feedback. I extend special thanks to the professors at Nanyang Technological University (NTU) Singapore for opening their doors and demonstrating a genuine interest in the conversation between the humanities and the sciences: Hallam Stevens, Bo An, Justin Dauwels, and Pham Quang-Cuong, who shared their knowledge and points of view over extensive interview sessions. Thanks again to Prof. Dr. Pham Quang-Cuong for showing me around at the NTU Robotics Research Center laboratory. Special thanks also go to the professors of the Summer Institute Futures of American Studies, Dartmouth College (June 2018) for

their feedback during the presentation of my work in progress and for further exchange of ideas: Eric Lott, Heike Paul, James E. Dobson, Duncan Faherty, Kyla Wazana Tompkins, and Ronald Judy. I am grateful to the Bavarian American Academy for supporting my participation at the Futures Institute (Dartmouth Stipend 2018). I thank Prof. Dr. Heike Paul and Dr. Margaretha Schweiger-Wilhelm.

I am indebted to the Centre d'Etudes Maghrébines à Tunis (CEMAT) for the Graduate Study Grant for a two-month research period at the University of California, Berkeley, to collect data for my research proposal. The data was useful throughout the entire process. The experience made a big difference in my career and opened several doors, allowing me to meet Richard Powers. A big thank you goes to Richard Powers for allowing me to conduct a series of interview sessions with him. Never have I ever had such richly intellectual conversations—they marked my life. My stay at Urbana-Champaign was also made special thanks to Jane Kuntz, with her interesting stories and a tour of the university. Thanks go to Prof. Dr. Margaret Larkin, for being my host professor at UC Berkeley. I am also indebted to my former professors at the Higher Institute of Languages of Tunis—Prof. Dr. Lynn Hannachi, who brought the works of Richard Powers to my attention, Prof. Dr. Saloua Essayah Cherif, and Dr. Raja Labadi Bousseadra—as well as Sami Saaied, the director of the Information Resource Center at the US Embassy in Tunisia.

I am extremely grateful to my husband, Michael Cerny, for his tremendous support. I cherish his care as well as the remarkable conversations about various topics. It is also never enough to thank my parents Cherifa and Ridha, as well as my siblings Sofian and Jihen and their sweet children and partners. I will always be grateful to Mourad and Fathi Ghalleb, with whom intellectual conversations never have an end. Finally, I wholeheartedly thank all my friends and anyone who helped make this experience beautiful and possible.

Munich, November 2021

Ines Ghalleb

Summary

This work focuses on four novels of the American author Richard Powers—*Galatea 2.2*, *Plowing the Dark*, *The Echo Maker*, and *Generosity: An Enhancement*—which reveal complex thematic and structural elements, highlighting interconnectedness between various disciplines. The novels deal with genomic network and genome editing, cognitive mapping and brain malleability, artificial intelligence, virtual reality and art history, as well as clashes between groups of the same identity and iconoclasm. The narrative techniques enmesh aspects from the interdisciplines at hand, creating an interdisciplinary structure. My discussion, therefore, explores modes of artificial evolution, revealing how interdisciplinarity constitutes a necessary structure, in an era of staggering advancements in technology and science, for the evolution of writing.

Richard Powers uses factual technologies from nascent fields and anchors the narrative within a well-informed discourse, based on scientific research and theories. Therefore, his novels are commonly argued to fall under a different genre than that of science fiction. I argue that, apart from the scientific theories, Powers' narratives deal with a large interdisciplinary network, sketching shifting movements and trends in evolutionary traceability. Furthermore, they rethink Western traditions by encompassing cross-cultural elements, extending to Middle Eastern contexts for instance. In this respect, I embark on an interdisciplinary method. The questions that arise are: What is the role of literature within other interdisciplinary discourses? What is necessary for literature (and the novel) to remain up to date and to avoid becoming obsolete?

I use a mixed method of theories from different disciplines and a cross-cultural background. I bring new elements by combining different theories together, specifically those of: Peter Kramer, Jennifer Doudna, Joseph Capgras, Vilayanur Ramachandran, Edward Tolman, Jean Baudrillard, Alan Turing, Ray Kurzweil, Walter Benjamin, Michael Taussig, Slavoj Žižek, Jaś Elsner, Bruno Latour, Carolina Cruz-Neira, and Bissera Pentcheva. I also conducted a series of interviews with Richard Powers at Urbana-Champaign, Illinois, and this book includes

an abridged version of these interviews. I also interviewed experts of artificial intelligence in Singapore. My work positions literary studies at the heart of emerging concerns, the future of our societies, and the future of the novel.

I reveal how interdisciplinarity is necessary for the evolution of the art, while I identify modes of artificial evolution in Powers' fiction. In part I, I address three types of artificial evolution: human genetic engineering, brain malleability, and artificial intelligence. Powers' novels experiment with artificial evolution in the light of the work of Ray Kurzweil and Jennifer Doudna. In the second part, I tackle the pitfalls of regression despite progress. Civilizational evolution and regression are at stake here, and I study clashes of groups with the same identity, as well as terrorism and wars. Finally, in part III, I examine artistic evolution through "*iconoclash*" (using Bruno Latour's concept). I demonstrate how the narratives interweave (CAVE automatic virtual reality system-, architecture-, scripture-) like structures. By exploring these aspects, the novels' interdisciplinary structures become prominent.

I demonstrate that the interdisciplinary novel, as crafted by Richard Powers, is liquescent, immersive, and interactive. It is multi-layered and multiplanar. Its narrative structures are imprinted with superimposed cross-cultural and interdisciplinary strata. These establish not only interconnections but also *exponential* trends.

My in-depth analysis of Richard Powers' narratives contributes to the field of American Studies. In addition, as I identify elements of the interdisciplinary novel, I offer a model valid for similar works. Exploring the evolution of the novel through interdisciplinarity contributes to the interconnectedness of knowledge and to the future of the art and the humanities. As our societies shift to an excess of self-isolation and intensive virtual communication—due to COVID-19—the question is renewed as to whether our cultural products would reflect more interdisciplinarity or minimalism.

Introduction

This book focuses on four novels of the American author Richard Powers that address the tangled relations between the scientific, technological, cognitive, and civilizational aspects of contemporary life—*Galatea 2.2* (1995), *Plowing the Dark* (2000), *The Echo Maker* (2006), and *Generosity: An Enhancement* (2009). My discussion explores modes of artificial evolution, revealing how interdisciplinarity constitutes a necessary structure, in an era of staggering advancements in technology and science, for the evolution of writing.

As the past three decades have been marked by technological breakthroughs and disciplinary conjunctions, the need for serious reconsideration of how the humanities are impacted by emerging sciences and technologies seems self-evident. Along with specialists in other disciplines (such as genetics, computer science, political science, bioethics, and cognitive studies), Americanists have begun to ask what's next, probing the implications, questions, and responsibilities that new scientific environments raise. Exploring the future of fiction through Powers' aforementioned novels, while identifying different modes of evolution, I also hope to shed light on their entanglement of form and content alongside their interdisciplinary structures.

In analyzing the complex ideas that drive their plots, narrative structures, and techniques, I expose the fundamental cross-cultural and interdisciplinary dimensions of these novels. The manifold topics broached include artificial human genetic evolution, technological evolution, cognitive capacities, and brain structures; clashes between groups with similar identities, wars, and terrorism; iconoclasm and artistic evolution. In reviewing such breadth, I hope to trace how Richard Powers' narrative techniques offer a new form for the novel that reflects—and, at the same time, challenges—our cognitive capacities. Indeed, in an age of scientific and technological superlatives, Powers probes the simultaneous emergence of revolutionizing theories, and inventive tools that may well revolutionize literature as we know it.

Such bold claims give rise to a host of questions. How do Powers' writing techniques reshape the form of the novel? How do these tech-

niques reflect on the future of the novel? And, more generally, how do they imagine the future of literature and the humanities? This book, then, tackles the question of how interdisciplinarity becomes the backbone of Powers' writing, and how it contributes, in turn, to the evolution of the novel. Within such an evolutionary framework, technological and scientific advancements not only come to the fore, what is equally highlighted is their entanglement with daily life, their impact on artistic and literary movements, as well as their ramifications for multiple future fields. Powers' four narratives flit across time—from prehistory to our own time and onward into the future—cross-fertilizing a course of origins and evolutionary dynamics.

Richard Powers has published twelve novels, all of which arguably contribute to the greater genius of contemporary American literature. Thus, to garner a deep and substantive understanding of the narrative techniques Powers employs, I delimit the parameters of my research objectives and analysis to just four novels. Indeed, while these four works exemplify Powers' means of rethinking writing against the artistic traditions of the West, especially those of the United States of America, they seem more focused on sketching shifting movements and noting trends in evolutionary traceability. Cross-cultural elements interweave, and join patterns of dialogue, enriching the narratives' mosaics. The interdisciplinary dimensions open up the novels further to an overload of information, angles of dialogue, and points of connectivity. Powers' novels are, thereby, steeped in networks (genomic networks, artificial deep neural networks, cognitive mapping, and artifact channels). Amid the interconnectedness, variations also surface (including genetic variabilities, hybrid identities, rare delusional dysfunctions, clashes, and structural strata). Clashes between groups of the same nation, religion, or ethnicity inform the orbit of civilizational rise and fall. Complex brain structures, regions, and architecture allow insights into interference, even as they architecturally serve the narrative framework. The make-up of the "simulacrum" space in the brain and virtual reality—coupled with the novels' civilizational and artifact strata—form a hyper-reality. This is also enabled through a focus on the entanglement of variations of reproductions and reconstructions among other features. The networks, present between all the components, shape superimposed

strata and “iconoclash.” Narrative variations and codes (DNA, computer programming, narrative coding...) all reside in, and pave the way for, an artificial state of evolutionary dynamics. The interconnections, hence, become visible in the interdisciplinary networks. Such is the means by which Powers crafts the interdisciplinary novel *par excellence*.

A close study of the four novels reflecting such interdisciplinarity brings into focus the superimposed structures of Powers’ narratives and magnifies their experimental techniques. Toward that end, I employ a mixed method of theories chosen from different disciplines, cultures, languages, and trends. That said, this book, however, does not promise a truly comprehensive treatment of Powers’ narratives and the techniques used, for they are beyond exhaustion. This account also attempts to avoid over-explanation and aspires to lay out narrative devices used in the novels that stand out as interdisciplinary. Also examined are novelistic techniques that keep the novels up to date *vis-à-vis* mass-technological and scientific progress, which, in turn, shape our mind, society, behavior, and reading practices. To delineate the novel’s complexity, interdisciplinary material—across branches of biotechnology, bioethics, cognitive neuroscience, political science, Middle Eastern studies, interfaith theology, art history, anthropology, philosophy of science, as well as machine learning—enriches the methodology. Much of the research—or innovations—that inform the background of the novels’ contexts emerged during the second half of the twentieth century, mainly between the 1950s and 1990s. The novels are also embedded within nascent fields, new combinations of branches, or breakthrough findings—usually marking a split in methods, practices, and theories. Both thematic and structural analyses target the narratives via an exploration of the multiplicity of coding symbolism and stratification of trends and branches. Following such a methodology, it becomes clear that Powers’ novels fashion a surface of *sables mouvants*—that is, a reading experience akin to quicksand.

The experiments, presented by Edward C. Tolman’s theory of cognitive maps in 1948, announced a divergence from behavioral psychology and the beginning of cognitive studies. Tolman’s theory also brought about a shift from understanding the brain in terms of static systematic function of input–output (i.e., black box) to an autonomous and

malleably complex architecture. The questioning of the brain as black box—and inclination towards complex and connected structures—surfaces in several instances in the novels of Richard Powers (e.g., *The Echo Maker* and *Galatea 2.2*). Alan Turing’s foundational idea of “thinking machines” (1950)—along with Rosenblatt’s concept of “perceptron,” an artificial neural network (1958)—led to the start of, and furthered advancements in, machine learning. Artificial intelligence has recently taken a peak through more complex methods such as deep neural networks, which are layered connections of information whose processing enables autonomous learning—notably used in automatic translation software and facial recognition systems.

The ambition to create intelligent machines amplifies in the theories of Ray Kurzweil based on the hype of “strong AI” (machines more intelligent than humans) and the “Singularity” (a human–machine merger). In his provocative book *The Singularity is Near* (2005), Kurzweil traces the major exponential-growth trajectories of possible inventions and their connectivity. Such technological evolution occurs through what he calls “the law of accelerated returns” (35). He also examines the major phases that mark six different epochs. Among these are: genetics, brain studies, and robotics—stressing that the latter, via nanobots, will be the most consequential in accelerating non-biological evolution. In this way, Kurzweil departs from Darwin’s theory of biological evolution by means of natural selection. Kurzweil’s theory places this technological evolution absolutely in the hands of humankind, albeit non-biological—a stark contrast to, say, the project of controlling the human genome and thereby artificially provoking biological evolution (Jennifer Doudna).¹ In the section that treats human genetic modification, a focus on enhancement—i.e., making better humans—is brought to the discussion through Michael Hauskeller. These theories and dynamics are interwoven in my analysis of Powers’ novels, where the different modes of artificial evolution are explored.

1 For a different reading on Darwinism, Creationism, and anthropocentrism, see Beer, Gillian, *Darwin’s Plots: Evolutionary Narrative in Darwin, George Eliot and Nineteenth-Century Fiction*.

Part II focuses on the necessity of restraint as key to civilizational evolution. Here, I show how Powers' narratives debunk Samuel P. Huntington's theory of the clash of civilizations by examining hybrid identities and variations within different conflicts and wars. Furthermore, this part addresses human regression despite technological progress. Therefore, analysis of the virtuality of the Persian Gulf War and terrorism is based on Jean Baudrillard's *La guerre du Golfe n'a pas eu lieu* (*The Gulf War Did Not Take Place*) and *L'esprit du terrorisme* (*The Spirit of Terrorism*), along with Slavoj Žižek's *The Desert of the Real*. While Middle Eastern issues are usually relegated to the sphere of Middle Eastern studies, Richard Powers, in situating such issues in a U.S. context, ensures the topic relevancy within American studies.

As for artistic evolution, part III of this work brings together two theories by Jaś Elsner and Bruno Latour with the examination of the Hagia Sophia to look at the different categorizations of the term iconoclasm and to introduce—when the iconoclastic act is unclear—Latour's concept of “iconoclash.” Elsner's focus on the antique-to-Byzantine iconoclasm and image cultivation adds a whole understanding of the Greco-Roman tradition that has impacted image use in art and philosophical thought in Western cultures. Elements of non-Western culture are also brought forth through the cross-cultural, cross-religious dynamics: The Ottoman elements in the Hagia Sophia and Islamic scripture. These dovetail the Byzantine Orthodox elements of the Hagia Sophia. An examination of architectural patterns and interior design aesthetics of the Hagia Sophia draws on perspectives and experiments advanced by art historian Bissera V. Pentcheva. *Plowing the Dark's* narrative construction is also tellingly positioned within the dynamics of CAVE technology—an immersive, interactive, virtual environment system. Therefore, Carolina Cruz-Neira's theories are used here. All of the aforementioned theories are extensively explained in tandem with the textual and thematic analyses throughout the book. Along with interdisciplinary and cross-cultural theories, my analysis relies on a close study of the novels.

My personal interviews with Richard Powers in Urbana-Champaign, Illinois, contributed to a better understanding of the richness of the novels' facets (see Appendix). Furthermore, I used the opportunity to

explore museums that Powers (and his characters) frequented—namely, the Art Institute of Chicago (in September 2014) and the Museum of Fine Arts in Boston (in June 2018), which helped me to better grasp the references to visual art. While conversing with Richard Powers about his novels offered unique insight into his techniques, I relegate the interviews to the background of my research to diverge from them in several ways.

In addition, I make use of conversations, notes, and visuals collected during research trips to exhibitions and conferences in different countries. In November 2019, interviews with experts in AI, robotics, and computational neuroscience, as well as the history of science at Nanyang Technological University in Singapore, broadened my research perspectives and outreach. Transcending the boundaries of disciplines and opening up a live discussion between the humanities and computer science experts there first hand led to helpful insights. The conversations were conducted with: Bo An (AI systems), Pham Quang-Cuong (humanoid robotics and locomotion and motor control in humans), Hallam Stevens (history and intersections of science and technology), and Justin Dauwels (computational neuroscience; real-time applications of AI for neurosurgery). This trip also brought me to the Robotics Research Center to observe the projects conducted by Pham Quang-Cuong along with an introduction to other projects at the laboratory. During my research period in Munich, I attended talks held by Slavoj Žižek, Antonio Damasio, and Michael Taussig, which were inspiring. Additionally, I was exposed to impressive installations during the multiple visits to the Art Biennale in Venice. In June 2018, I joined the summer institute Futures of American Studies in Dartmouth College. In September 2020, I visited *Chauvet2*, which is the reconstruction of the Chauvet-Pont-d'Arc cave (Ardèche, France), the paintings of which are estimated to be 36,000 years old. The guided tour gave me a better understanding of the complexity of the Upper-Paleolithic paintings. All these experiences have not only sharpened my discussion of the emerging issues, but also honed my perspectives on prehistoric art and the trajectories of artistic evolution.

Knowledge as produced in antiquity in the Greek tradition was not dissected into any of the branches or disciplines of modern times. Scholars had a broader, more encyclopedic expertise, encompassing

several “fields.” The tradition was also seen in the heyday of Alexandria. The second period of the late Abbasid era in the Middle Ages, marked by a rise in intellectual production first in Baghdad and then in Andalusia, saw a continuity of the heritage in the format of encyclopedic knowledge. It was not until the nineteenth century that knowledge was divided into disciplines in Germany.² With the recent emergence of hybrid disciplines and interdisciplinary centers, an open discussion on interdisciplinarity has taken an important turn in a new framework over the past three decades. This shift of divisions and openness has had a decided impact in the form of digital humanities, for instance, and represents an opportunity for literary studies. Therefore, in this book, the necessity arises to explore interdisciplinarity as a technique and structure that reshapes the novel just as it has undoubtedly influenced the foundations of Powers’ novels.

According to Harvey J. Graff, although interdisciplinary research may be traced back to the 1940s through the 1960s in the “collaborations” that led to the development of the atomic bomb and the isolation of DNA, the method gained momentum in the 1990s with the project to map the human genome, bringing geneticists and information-technology experts together (Graff 3). The importance of interdisciplinarity has grown ever since with the rising number of publications and projects adopting the approach (1). Indeed, interdisciplinarity is becoming more and more prominent since, to borrow Graff’s statement, “scientists are interested increasingly in problems so broad and complex that they are unlikely to be solved by researchers trained in one discipline, working alone” (3). Indeed, concerns with complexity apply equally to humanists.

In contemporary research, various methodologies rethink modern disciplinary divisions. In parallel to interdisciplinarity, these are multidisciplinary, transdisciplinarity, and indisciplinary. Attempts at defining the different approaches overlap in ways that make it hard to identify clear demarcations.³ The methodologies differ in the degrees

2 *The Oxford Handbook of Interdisciplinarity* (6).

3 Cf. Harvey J. Graff, *Undisciplining Knowledge: Interdisciplinarity in the Twentieth Century* (2015); Robert Frodean, editor, *The Oxford Handbook of Interdisciplinarity* (2010); Basarab Nicolescu, “Multidisciplinarity, Interdisciplinarity, Indisciplinarity, and Transdisciplinarity: Similarities and Differences” (2014); and Jay Hillel Bernstein, “Transdisciplinarity: A Review of its Origins, Development, and Current Issues” (2001).

with which they transcend modern disciplinary boundaries and in their approach to knowledge integration and synthesis. Multidisciplinarity has the least impact on the disciplinary divisions, for it involves teams of scientists tackling an issue “from their own disciplines” (Graff 4). Transdisciplinarity takes an extreme approach in terms of, as Basarab Nicolescu explains, going beyond all disciplines and dismissing any old “axioms” (20). However, transdisciplinarity risks becoming a “temporary fashion” if not addressed in the totality of its theoretical, phenomenological, and experimental aspects, as Nicolescu warns (*ibid.*). Finally, and in a more radical method, indisciplinarity advocates a complete rejection of disciplines and methodology.

In contrast, interdisciplinarity is interested in the interaction between the disciplines, where “the process begins with each team member learning the language of other disciplines” and “borrowing from their methodologies” (Graff 4; Nicolescu 19). Because Richard Powers’ novels navigate both disciplinary and interdisciplinary discourses, theories, and methods, this validates the use of the term “interdisciplinarity” in this work. Furthermore, Powers’ novels stress the dialogue between disciplines and interdisciplines, while building on older theories and practices. Powers’ novels reveal a trajectory of the build-up of knowledge, disciplines, and artifacts in accumulative processes and accelerated returns over a *longue durée* and in exponential growth. On the other hand, while both are concerned with complexity, transdisciplinarity rejects the theory of the accumulation of knowledge—dismissing, as Nicolescu puts it, “a mathematical bridge between science and ontology” (21). Richard Powers’ aforementioned novels are, therefore, studied in light of interdisciplinarity instead of a methodology of transdisciplinarity. While the terminologies are usually used to describe methods and practices of research as well as academic programs, in this work, I deploy interdisciplinarity not only in that sense of the term but also as a narrative structure that reveals the superimposed strata of disciplines, interdisciplines, and artifacts.

To understand the possible degree of intentionality involved, it is also crucial to briefly look into the life and career of Richard Powers. He was appointed writer-in-residence at the University of Illinois Urbana-Champaign in 1992 with a full position at the cognitive neuroscience

group of the Beckman Institute for Advanced Science and Technology at Illinois (Forrest). Indeed, the Beckman Institute was one of the first research centers of its kind, thirty years ago pioneering interdisciplinary collaboration between fields to produce innovative and combinational findings (Illinois Beckman website). As of 2014, the Institute garnered a reputation for its “leading-edge research in the physical sciences, computation, engineering, biology, behavior cognition, and neuroscience” (ibid.). It was at that time already home to “1,500 researchers from 43 University of Illinois departments”; and areas of research focus were, mainly; biological intelligence, human-computer intelligent interaction, integrative imaging, and molecular and electric nanostructures (ibid.). The major aim of the Beckman Institute is to overcome “many of the limitations inherent in traditional university organizations and structures” and to minimize “the barriers between traditional scientific and technological disciplines to yield research advances that otherwise would not occur” (ibid.). Analogously, Powers uncannily navigates disciplinary boundaries himself. His experience at the Interdisciplinary Center made him a sort of liaison between the humanities and sciences, as well as between these fields and the outside world. Richard Powers even blurs the lines of fiction and the true to life, for his appointment to the cognitive neuroscience group of the Beckman Institute in 1992 was the inspiration for *Galatea 2.2* (Forrest).

Apart from his successful career as a novelist, Powers was a teacher of creative writing at the English Department at the University of Illinois, Urbana-Champaign, and he was a visiting teacher and writer at Stanford University on two occasions. During his undergraduate studies, Powers switched from majoring in physics to continue his studies in English and rhetoric due to his resentment towards the overspecialization of the field and a desire for study with a broader scope.⁴ His oscillation between the sciences and literature continued, for he worked as a computer programmer in 1980 following his M.A. studies, only to start a career as a writer upon sudden inspiration derived from August Sander’s photography at the Museum of Fine Arts in Boston (“The Last

4 Richard Powers, *Studio 360 Audio Interview with Kurt Andersen, October 23, 2009, with a Focus on Generosity*. Also, Joseph Dewey, *Understanding Richard Powers* (7).

Generalist” (98); “The Art”).⁵ Richard Powers is now considered to be one of the best American authors alive; he was the recipient of the 2006 National Book Award for his novel *The Echo Maker* and a MacArthur Fellow. His most recent novel, *The Overstory*, was awarded the 2019 Pulitzer Prize for Fiction and the 2020 William Dean Howells Medal. Apart from his connection to the interdisciplinary center and close contact with experts from various fields, he also uses unique strategies in his writing: Take, for instance, the speech-to-writing software in *The Echo Maker*⁶ or his total self-confinement for a year while writing *Plowing the Dark* to experience the character Taimur Martin’s isolation as hostage and isolation by means of technology for the virtual reality team.⁷ Now, in turn, with my own confinement and social distancing in Munich—in alignment with the measures taken nationally and internationally as a consequence of the COVID-19 pandemic in 2020—I found myself also observing the implications of the fluidity of time, isolation, and virtuality of connections through a confined space, which intensified all the more during the end phase of writing my dissertation.

While fascinating scholarship has been written about Powers’ novels, it is limited, usually only appearing as essays amid a collected volume. In many cases, there is also a lack of depth in the scope of their analyses of the novels, often missing the gist of Powers’ unique approach to the art. Still, worthwhile readings can be found in the collected volume *Intersections: Essays on Richard Powers*, edited by Stephen J. Burn and Peter Dempsey, which includes—among others—an essay by Bruno Latour, “Powers of the Fascimile: A Turing Test on Science and Literature,” “Narrating Technology” by Carter Scholz, and a short text by Powers himself. Mark C. Taylor’s book *Rewiring the Real* is somewhat informative on *Plowing the Dark*, placing the conversation within the work of other contemporary authors—William Gaddis, Mark Danielewski, and Don DeLillo. Conference proceedings collected in the volume *Ideas of Order: Narrative Patterns in the Novels of Richard Powers*,

5 *Young Westerdal Farmers on Their Way to a Dance, 1914* by German photographer August Sander (Berger, “Richard Powers, The Art of Fiction No 175”).

6 Richard Powers, “How to Speak a Book” (1); Alec Michod, “An Interview with Richard Powers.”

7 Interview by Kevin Berger, “Richard Powers, the Art of Fiction No 175.”

edited by Antje Kley, also offer important views—especially Heinz Ickstadt’s “Asynchronous Messaging’: The Multiple Functions of Richard Powers’ Fictions.” In the same volume, Heike Schäfer and Karin Höpker address notions of consumerism and the biomedical self in a post-genomic era. Powers himself has penned essays and engaged in interviews, where he elaborates on his writing techniques, some of which are available on his website.

Many have tried to pigeonhole Powers’ genres in an attempt to confirm that his novels should not be labeled as science fiction, only to offer a different model instead. Such labels have varied from the technological novel to the virtual novel and from the encyclopedic novel to factual fiction (and so on). These labels tend to merely highlight only a narrowed aspect of Powers’ work or otherwise lend the impression of an old-fashioned style. Critics often draw attention to how Powers’ novels fall under the tradition of Thomas Pynchon and William Gaddis, and Richard Powers himself recognizes the impact of these writers on his style. At the same time, his works reference many other novelists as well as poets and artists.

As Klaus Benesch points out in his essay “In the Diaspora of Words,” William Gaddis captures both modern and postmodern elements of originality and simulacra in *The Recognitions* (32). Richard Powers’ narratives push this hybridity of literary movements even further as they borrow stylistic elements from the pre-historic to the antique, and from realism to modernism and postmodernism. His novels trace the evolution of writing and of artistic movements, while employing cross-cultural elements of storytelling. The hints at *One Thousand and One Nights*, along with the Persian storytelling techniques, mark the possible traceability of the origin of the novel to the Persian frame story of Scheherazade. However, the origin of narrative construction is again questioned in reference to the prehistoric drawings of the Lascaux caves, which in turn remind us also of their precursor, the Chauvet-Pont-d’Arc cave. Similarly, the allusion to Cervantes’ *Don Quixote* invites us to rethink the Anglo-Saxon tradition of attributing the origin of the novel to Daniel Defoe’s *Robinson Crusoe*.

Like William Gaddis’ works, Richard Powers’ fiction evolves through his publications, updating concerns from the first novel and transform-

ing continuously until the most recent one; however, this will not be the concern of my work. I am much more interested in the evolution of the art within a *longue durée* and in relation to cultural, civilizational, and interdisciplinary cross-fertilization. Concerns about origin, ready-mades, simulacra, and the virtual occur repeatedly in Powers' fiction in an updated context of artificial intelligence, smart bombs, and CAVE technology, for instance. As Mark C. Taylor puts it in *Rewiring the Real*, "the world Gaddis foresees" in *JR* and *The Recognitions* "is the world that Powers" (as well as Danielewski and DeLillo) "know[s] as [his] own" (7; [*my additions*]). Taylor calls this world "network culture" (8), and Powers' novels are indeed a continuity, emerging from Gaddis and Pynchon, with an aspect of evolution. Certainly, his exposure to the multitude of artistic and interdisciplinary references produces accelerated returns and a shift in style.

In his essay "Encyclopedic Narrative: From Dante to Pynchon," Edward Mendelson stresses that the encyclopedic narrative "evolves out of epic and often uses epic structure as its organizing skeleton" (1269). Mendelson identifies these "literary monuments"—i.e., the encyclopedic narratives—from Dante's *Commedia* to Pynchon's *Gravity's Rainbow*, including in between Rabelais' five books of Gargantua and Pantagruel, Cervantes' *Don Quixote*, Goethe's *Faust*, Melville's *Moby-Dick*, as well as Joyce's *Ulysses* (1267–1268). Since Powers' novels repeatedly catalogue these encyclopedic narratives, they assert a form of continuum and interconnectedness of the works of art. This continuum falls into non-linear patterns of transformation and exponential evolution. Therefore, unlike Mendelson's criteria for the encyclopedic narrative, Powers' fiction deals with modes of artificial evolution and exponential trends instead of rendering a historical account. Furthermore, his narratives are immersed in the movements, theories, and approaches of the different interdisciplines, offering more than mere synecdoches to a minor element or a field.

In this work, I do not intend to offer a comparative study of the catalogued literature. Rather, I choose to focus on the following four novels of Richard Powers—*Galatea 2.2*, *Plowing the Dark*, *The Echo Maker*, and *Generosity: An Enhancement*. While Powers' fiction stems from American world literature and the encyclopedic narrative, the label "the inter-

disciplinary novel” best captures his style. Taylor confirms that Richard Powers is “the rare novelist” whose in-depth knowledge of scientific and technological theory exceeds that of his contemporaries (*Rewiring* 7). In addition to scientific theory, Richard Powers experiments intensively with interdisciplines and their cross-fertilization. To borrow Taylor’s statement, Powers “sees connections where others see oppositions” (7), and apart from the international and global framework, his narratives are cross-cultural. Their interdisciplinary structure aims at the evolution of the art into the post-postmodern condition and beyond: a merger of artificial evolution and artificial intelligence. This, in turn, paves the way for on-going transformations and connections, such as: transdisciplinarity and the post-pandemic condition.

The interdisciplinary novel is multiplanar, interconnected, and exponential. It uses methods and theories from interdisciplines such as biotechnology, genomics, machine learning, cognitive neuroscience, Middle Eastern studies, interfaith theology, art history, and CAVE virtual systems. Its elements are revealed through modes of artificial evolution, artistic evolution, civilizational dynamics, cognitive malleability, the hyperreal, iconoclasm, variations and hybridity, as well as the cross-cultural. My work, therefore, seeks to mine the richness and complexity of Richard Powers’ novels in an interdisciplinary and contemporary manner.

A summary of each of the analyzed novels contributes to a better understanding of the reasons behind the scope of my work. *Galatea 2.2* tackles a bet between engineer and neurologist Philip Lentz and writer-in-residence Rick Powers to construct an artificial human brain at a laboratory at the Center for the Study of Advanced Sciences at the university U. Rick trains the machine’s neural networks and feeds them with canonical literature. He observes the development of the implementation and its artificial intelligence, in the hope that the final product (Implementation Helen) passes a test against master’s literature student A. *Plowing the Dark* explores an IT project of a virtual reality environment Cavern in Seattle, where Adie Klarpol (a painter), Steve Spiegel (a poet), and several engineers work on the realization of different virtual rooms. In a parallel narrative plot, a half-American and half-Iranian English teacher, Taimur Martin, is taken hostage by a terrorist group and kept blindfolded in total seclusion in Beirut, Lebanon. The

plots are intersected by the outbreak of the Persian Gulf War. *The Echo Maker* is situated in a post-9/11 context, where a traffic accident causes Mark Schluter to suffer from a degenerative delusional brain disease: Capgras syndrome. The disease leads to dysfunction in Mark's capacities to recognize his sister, Karin, whom he perceives as an imposter. *Generosity: An Enhancement* stages an enhancement project on a reality TV program for scientific discussions, where the genomicist Thomas Kurton promises a cure for sadness through germline editing of the human genome that would lead to fixed future generations. Thassadit Amzwar demonstrates a uniquely blissful mood that raises scientific and social curiosity.

This work is divided into three major parts: the first part studies the peak of scientific and technological evolution that stresses the pressing urge for non-natural evolution. The study of genomic complexes and human gene editing—along with brain regions and degenerative delusional diseases, and brain recreation—stresses the pursuit of human artificial evolution. The second part, however, is concerned with civilizational evolution through restraint and variations. It addresses regression despite progress, where the apex of human deterioration is explored within regional and global crises in the forms of conflicts, terrorism, and wars. Here, hybrid identities are studied along with the clash between different groups sharing the same geographical, ethnic, or religious identity. Finally, the third part explores narrative “iconoclash,” interweaving virtual CAVE-, architecture-, and scripture-like structures. Such is my approach, having reflected on the innovative, experimental narrative constructions of Richard Powers' *Galatea 2.2*, *Plowing the Dark*, *The Echo Maker*, and *Generosity: An Enhancement*. These four novels mark artistic-literary evolutions of the genre in ways that keep up to date with the era of technological and scientific mass production and advancement.

Part I Artificial Evolution: The Pursuit of Enhancement

Part I of this book paves the way for an understanding of the modes of artificial evolution which are revealed in Richard Powers' novels. It exposes the underlying theoretical dynamics. Modes of artificial evolution are visible in the promise of human genetic engineering, as seen in *Generosity: An Enhancement* and as discussed in chapter 1. In chapter 2, this is followed by an examination of a model of cerebral evolution and brain plasticity in the context of the character Mark Schluter in *The Echo Maker*. Chapter 3 focuses on *Galatea 2.2*, and engages in an analysis of artificial intelligence and deep neural networks, exposed via an attempt to recreate the human brain. Part I, therefore, relies heavily on the theories of Ray Kurzweil, and it makes use of Jean Baudrillard's "simulacrum" and Edward Tolman's cognitive mapping. It also builds on Walter Benjamin's "mimetic faculty" and Alan M. Turing's "thinking machines." Additionally, it draws on theories by Jennifer Doudna, Peter D. Kramer, and Klaus Peter Lesch. The novels establish deep connections to infant fields (genomics, cognitive neuroscience, and machine learning) which emphasize aspiration to human artificial evolution—in a Kurzweilian sense to an extent. The three chapters interconnect and overlap, stressing the importance of knowledge accumulation. Studies on brain functions have provided insights into brain regions, which, in turn, inform human brain recreation and brain reverse engineering.

To begin with, enhancement takes the form of artificial evolution through human genomic sequencing and genetic engineering. Rethinking the future of human beings is further discussed in the following chapters, progressing gradually through different angles of brain studies and technological evolution. The concern with the future of the novel, however, is especially discussed in the third part of this book. For this reason, a sub-chapter here sketches writing in the post-genomic age only briefly.

Chapter 1 Genomic Network in *Generosity: An Enhancement*

Generosity: An Enhancement captures a complexity at multiple layers; it deals with a controversial scientific and ethical theme on genomics and enhancement—with a focus on the obsession with happiness—reflecting on the future of humanity. It welcomes an intricate involvement of media, a genomicist (Thomas Kurton), a bioethicist, the individual, and society. In this respect, all the angles of perspectives are polarized and staged on the platform of the reality TV show, “The Genie and the Genome,” and in the novel’s unfolding events. In a promise to create forever-happy offspring, the genomicist, Thomas Kurton, in *Generosity* claims that sadness is embedded in the genes and that it is a disease that has to be “cured” through gene editing (*Generosity* 43). The experiment, as he argues, could be possible by conducting research on Thassadit Amzwar’s genomic make-up to identify the “happiness gene” since Thassa appears as constantly euphoric—“hyperthymic” (211; 156). Although the narrative unfolds in observation of the scientist’s claims—like the audience of reality TV—the rising actions take a final shift in social hysteria, condemning the protagonist Thassadit Amzwar for accepting selling her ova, and in Kurton claiming ownership of the genomic findings.

The interwoven aspects of the narrative take shape in a labyrinth of opinions, logic, emotions, and impulses. At the same time, they stage a mesh of science and bioethics, where questions remain unanswered. The topic of enhancement and human genetic engineering is consequently marked with a complexity that resists jumping to decisions or conclusions. The reader spirals through the dizziness of thoughts of Thassadit Amzwar, her teacher Russell Stone, and counselor friend Candace Weld, as much as through the change of positions of society, the scientist’s certainty of his “arrogant” claim, and the buzz created by media. In a rollercoaster of assumptions and indecision, there is neither an answer, nor one-sided bias.

The scientific claim in *Generosity* does not take shape into a creation of a dystopian world of monsters and, on the other hand, *Generosity*

does not offer a utopian picture either. The narrative displaces scientific research from the laboratory to reality TV and shifts the focus to the impact of social blame. Therefore, it leaves the experiment trapped within polarizations, under the absurdity of instant judgment and oscillation of public opinion from the extremes of adoration to public shaming, which seem to have caused Thassa's suicide, or at least her distress. *Generosity* invites the reader to consider all the perspectives possible, and casts them into the dilemma of decision making as a process of assessment and a suspension of judgment. It invites the novel and the brain into the laboratory and bioethics debates, to expand knowledge beyond the fictional towards the world of scientific experiments, and human "futuristic" concerns. Thus, with a concern to "make writing come alive," Richard Powers edits his novel's literariness with scientific jargon, and he embarks on the quest for the future of human beings, science, and the novel itself.⁸

Generosity: An Enhancement revolves around the story of the Algerian refugee Thassadit Amzwar, who exhibits an extreme condition of happiness that attracts the curiosity of the genomicist, Thomas Kurton, and triggers his interest in mapping her genomic makeup as part of his experiment to cure sadness through human gene engineering. In the meantime, Thassa's teacher, Russell Stone, observes the televised debates and obsesses over happiness material and creative writing. The spatial setting of the novel takes place in Chicago, and mostly, on the scenes of the televised science show: "The Genie and the Genome." The narrative also unfolds in the creative non-fiction classes of Russell and, briefly, in Tunisia through Tonia Schiff's reportage trip. At the background, in Thassa's writings and through Russell's thoughts, events in Algeria come to the fore as well. The novel was published in 2009, and the temporal setting of the events is placed mostly in the 1990s. The period is crucial in the novel's events for several groundbreaking aspects in life sciences, society, and forms of cultural production. The period witnessed a surge in the use of antidepressants in the United States; as well as developments in genome sequencing projects world-

8 In *Generosity: An Enhancement*, Russell's syllabus includes a fictive theory book on writing fiction, titled *Make Your Writing Come Alive*, by the fictive theorist P. Harmon (33, 144).

wide and discussions over human enhancement. Another aspect pertinent to the novel and to the 1990s is the rise of reality TV on American television, as well as the emergence of personal text blogs, and travel video blogs (vlogs) on the web.

According to biochemist Jennifer Doudna,⁹ DNA sequencing—permitting us to “read and record” the information of the human genome—started in 1970, but it accumulated into “the completion of the Human Genome Project,” through which scientists around the world had teamed up to sequence the entire human genome in early 1990 (*A Crack in Creation* 14). The method helped identify connections between “thousands of gene variants and a number of physical and behavioral traits” as well as delineate the “more than four thousand DNA mutations” responsible for genetic diseases (15). Thanks to progress in “biotechnology tools and biochemical methods” in the 1970s and 1980s, it became possible to “cut and paste” DNA segments “into genomes and isolate specific gene sequences” (19). As Doudna puts it, the field has seen, therefore, very many improvements since, but it has also witnessed hazardous consequences with a case of death in 1999, and leukemia in five patients in the early 21st century (20–21). By refining the methods, scientists reached direct gene manipulation by inserting DNA into the cells of fertilized mice eggs that generated inherited change in offspring (22). Towards the end of the 1980s, Oliver Smithies introduced a new method based on pasting “homologous recombinant DNA [i.e., DNA made in the laboratory]” to repair, or replace a deficient gene; this approach, which was further developed by Mario Capecchi, offered the possibility to mute genes, enabling effective ways to analyze their functions (24–25).

In the novel, genomicist Thomas Kurton’s claim becomes problematic. It touches upon human germline engineering, which consists of the genetic manipulation of the reproductive cells (in this case the ovum)—leading to alterations that are heritably transmitted (*Generosity* 105). Kurton promotes the technique as necessary to manipulate human evolution artificially—in desirable and controllable ways. The

9 Jennifer Doudna was awarded the 2020 Nobel Prize in Chemistry with Emmanuelle Charpentier for the development of the genome editing tool CRISPR-Cas9.

interdisciplinary field of genomics is interested in an organism's whole genomic structure and functions. It attempts to identify the genetic network, and analyze how certain genes influence one another, or influence a whole mechanism. Doudna points out that the term "genome"—first appeared in 1920 through the research of German botanist Hans Winkler, which, as she explains, might have been a "portmanteau for *gene* and *chromosome*"—"refers to the entire set of genetic instructions found inside a cell" (*A Crack in Creation* 8). Doudna elaborates that the genome is responsible for informing "all living things how to grow, how to sustain themselves, and how to transmit genes to offspring" (8). She adds that "our intrinsic physical traits," including proneness to dysfunction, "are the result of information encoded in our genomes" (8).

Having contributed to the invention of the CRISPR-Cas9 technique, Jennifer Doudna argues in *A Crack in Creation* that, with the rise of sophisticated biotechnology, the Anthropocene era starts—in which genetic alteration is "fully under human control" in more informed and direct ways than breeding or natural selection (xiii).¹⁰ She affirms that, with the new CRISPR technique, "the genome—an organism's entire DNA content, including all its genes—has become almost as editable as a simple piece of text" (xiii). As Doudna elucidates, CRISPR-Cas9 revolutionizes biotechnology by offering the simplest and most effective methods of gene manipulation (xiii). She established that, once the genetic code for a specific character is identified, CRISPR permits to "insert, edit, or delete the associated gene in any living plant's or animal's genome" (xiii).

In the novel, the topic of human gene engineering intertwines with the ethics of enhancement. In his book *Better Humans? Understanding the Enhancement Project*, philosopher Michael Hauskeller defines the concept of "human enhancement" in reference to improving the human (i.e., their capacities or traits) via interventions of biomedicine (1). He starts with an observation on the rhetorical question uttered in 1998 by molecular biologist James Watson, "if we could make better human beings by knowing how to add genes, why shouldn't we do it?" (1). Hauskeller assumes that Watson's remark is directed to

¹⁰ CRISPR is acronym for clustered regularly interspaced short palindromic repeats (*A Crack in Creation* 41).

“critics of non-therapeutic human germ-line” manipulation (1). Following this, Hauskeller launches into a philosophical interrogation of the larger scope of the endeavor that he believes to mean “enhancing the human as such” (1). Respectively, he investigates the kind of implications, which such a stipulation can impart, and he rethinks the possible connotations of amelioration within performance-based frameworks.

This chapter, “Genomic Network in *Generosity: An Enhancement*,” first looks into the premise of Thomas Kurton that emotions are embedded in genes; second, it reflects on gene editing and the interconnection of emotions; and third, it explores how the novel transcends the binaries of healthy/pathological in order to fuse the ethics behind cure/enhancement—revealing decision quandaries and entanglement. In this context, enhancement takes the form of artificial evolution through human genetic engineering and the removal of obsolete genes. During the analysis, brief notes will be made on the writing process.¹¹

1.1 Emotions in Genes: How Programmed Are We?

Research on the definition and origin of emotions has been ongoing for centuries without reaching a final answer. The issue has migrated over time into various disciplines: philosophy (Descartes), physiology (Charles Darwin and William James), psychology (Freud), and psychiatry (Menninghaus). The theoretical flight exposes the complexity of affect and the limitations of each discipline in coming up with a definite answer, highlighting the need for interdisciplinary and cross-disciplinary investigation of the matter. Among this chain of disciplines, and the migratory flight of the study of emotions, comes genetics through which *Generosity* exposes another unanswered question about affect. That is whether emotions are embedded in the genetic code. Here, the stress is placed on gene “variations” and on the “genomic network,” responsible for connecting “the brain’s emotional centers” (Powers, *Generosity* 156).

11 Focus on structural analysis is reserved for *Plowing the Dark* in part III.

In the following passage, the fictive genomicist Kurton explains to Thassa the genomic make-up that generates specific emotions and how he is interested in mapping her genetic markers.

He tells her about the hot sites already located: the dopamine receptor D₄ gene on chromosome 11, whose longer form correlates with extroversion and novelty-seeking. He describes the serotonin transporter gene on the long arm of chromosome 17, whose short allele associates with negative emotions.

‘You want to see how long my genes are?’

‘We’re studying a genomic network that’s involved in assembling the brain’s emotional centers. A few variations seem to make a lot of difference. We’d like to see what varieties you have.’ (*Generosity* 156)

In addition, part of Kurton’s research is concerned with methods of screening the genes supposedly responsible for negative emotions: “At the Wyde Institute, Kurton helped to develop a technique called rapid gene signature reading. Using it, he has produced three landmark association studies, isolating complexes of genes correlated with susceptibility to anxiety, childhood hyperactivity, and depression...” (*Generosity* 24).

Molecular psychobiologist Klaus-Peter Lesch comes forward with a similar proposition in a research, published in 2004 in “Gene-environment Interaction and the Genetics of Depression,” claiming the existence of a specific complex and heritable “genetic mechanism” that accounts for a favorable milieu for developing “depressive disorders” in the human (175). He also refers to the increasing evidence in relating genetic network composition to a predisposition for “personality traits” that are considered to display the “negative emotionality” of anxiety and aggressiveness apart from depression (177). Jelena Radulovic and Bratislav Stankovic advance a congruous hypothesis in their essay, “Genetic Determinants of Emotional Behavior: Legal Lessons from Genetic models” (published in 2007). They examine the genetic-based forms of stress behavior, such as anxiety and fear and their connection to aggressive behavior in rodents (Radulovic & Stankovic 401). However, scholarship has traced back emotions only partly to the genetic construct—acknowledging environmental influence as well.

Concerns with the percentage breakdown of gene–environment influence on affect is verbalized in Russell Stone’s question: “How programmed are we?”

Chance grows like a tumor in [Russell] Stone. Ever since Thassa went to Boston, he’s been plagued by the body’s code, the twenty thousand genes hatching their million protein votes into his heart, lungs, and flooded brain. In the dark, safely on his end of the phone line, he asks counselor [Candace Weld], ‘How programmed are we?’

Candace will not fictionalize for him. The data keep accumulating: impulsivity, aggression, anxiety, self-destruction—all heritable. The genetic contribution to addictive behavior: 30 to 50 percent. Anorexia and bulimia: a 70 percent genetic component. ‘But still, the students who come to see me change. They can get better.’

‘From talking to you? Or from drugs?’

‘From both [...]’ (*Generosity* 165–166; [my additions, my omissions])

Giving feelings a simplistic origin that is locked within the genetic code represents a danger of claiming an inherent essence in humans, which comes with the pitfalls of pre-determinism. To claim that aggression, for instance, is genetically embedded implicitly underlines that criminals are already programmed to be so. Thus, such a statement sounds like treading on thin ice, possibly condemning a certain category of people on the basis of their genetic code.

Generosity shakes assumptions while foregrounding possibilities and impossibilities through fictionalizing scientific discourse. Yet the novel does not emerge into a narrative that condemns and rejects science but rather into a narrative that calls for deeper thinking, and critical involvement from all sides: scientists, bioethicists, individuals, and society. Pragmatically speaking, Thassa’s past—marked by traumatic events of political turmoil in her home country Algeria (such as the death of her parents and her status as a refugee)—constitutes an obvious scenario for the development of a post-traumatic condition. Thassa, on the contrary, is depicted as constantly and curiously overjoyed, to the

extent that her professor, Russell Stone, labels her as the “hyperthymic” type of joyousness. He remarks: “Ten years of organized bloodbath have reduced a country the size of western Europe to a walking corpse. And Thassa has emerged from that land glowing like a blissed-out mystic” (*Generosity* 38). The disconnection of cause and effect in the psychic condition hence refutes the psychological aspect of emotions and embeds affect in a deeper and more stable coded essence. Therefore, a genetic explanation is further confirmed in this scenario.

Whereas Thassa is a fictional character and her illogical condition may be accounted for by the fantasies of fiction, Richard Powers claims that Thassa’s character is inspired from a person he actually knows (*Studio 360 Audio* 5:27–6:53). Thassa’s possible real prototype is male and is depicted by Powers as continually “laughing in delight to the world,” regardless of his extremely traumatic history in the aftermath of the Iranian revolution. He was “imprisoned,” “severely tortured,” and “sentenced to death” under the post-revolution Iranian regime, but he was set free following a diagnosis with “terminal cancer” (*Studio 360 Audio*). As a result, he took refuge in the United States and overcame the disease through treatment (*Studio 360 Audio*). The parallelism of a traumatic past with the non-pragmatic euphoric state—seen in both the fictive character and Powers’ friend—marks a collision between fiction and reality, further raising the issue of the premise for a genetic code for affect. In her article “The Pursuit of Happiness 2.0: Consumer Genomics, Social Media, and the Promise of Literary Innovation in Richard Powers’ Novel *Generosity: An Enhancement*,” Heike Schäfer holds that the narrative explores “the representational possibilities of creative nonfiction to invent a form of factual fiction that may express the complexities of the post-genomic digital age” (276). In this respect, Powers’ novel moves outside the literary bubble as the author takes a broader role in cogitating knowledge beyond the boundaries of institutionalized expertise. Again, the novel is crafted to be the space of imagination of all scenarios in an experimental simulation not only of form, but also of all ideas possible and not-yet possible.

1.2 Enhancement: Gene Editing or *How Programmable Are We?*

If the premise of a gene of sadness is true, would it be best for humanity to eliminate it? Thus is Thomas Kurton's promise to enhance human evolution out of primitive and obsolete natural selection. Thomas Kurton's claim that sadness is pathological and that it has to be cured/eliminated transcends the binaries of healthy/pathological, positive/negative, functional/defective, useful/odd, beneficial/destructive, and cure/enhancement (*Generosity* 43). Here, two aspects arise for consideration: whether human evolution still requires negative emotions and what possible interconnections exist between emotions.

1.2.1 Use of Negative Emotions

Within the framework of enhancement via elimination of negative affect, it is important to look at whether other "negative" emotions—such as fear, timidity, anger, revolt, disgust, confusion, being overwhelmed, discomfort, and hatred—should also be omitted. The feeling of fear is the denominator in reactions of flight or self-defense (e.g., the bear scenario in Descartes/James). The complexity of the emotion of fear is, in this case, connected to the complexity of the reaction to danger, which may be one of the core natural mechanisms that are crucial for survival. For Kurton, however, sadness and the fight/flight mechanism are now to be considered obsolete, and no longer necessary since mankind has evolved.

Thomas Kurton has never doubted that happiness is chemical. Meaningless to call it anything else. Like a third of the country, he's tried mood brighteners. They did indeed brighten him, a little. But they also smeared him. They took away a little of that fighter-pilot clarity. So he ditched the brighteners; if he had to choose, he'd rather be keen than bright.

But he has never accepted that people should have to choose.

He talks often about the massive structural flaw in the way the brain processes delight. The machinery of gladness that *Homo sapiens* evolved over millions of years in the bush is an evolutionary hangover in the world that *Homo sapiens* has built. Back on the savannah, stress kept us alive. Natural selection shaped us for productive discontent, with glimmers of heavenly mirage to keep us going. As Kurton puts it in his article ‘Stairway to Paradise’:

A mix of nasty neurochemical pathways, built, doubtless, by a small set of legacy genes, now plagues us with negative feedback loops and illusory come-ons. What passes for everyday consciousness feels to me increasingly like borderline psychosis. Depression had its uses once, when mankind was on the run. But now that we’re somewhat safe, it’s time to free the subjugated populace and show what the race can do, armed with sustainable satisfaction at last. (*Generosity* 43)

Kurton claims that there is nothing that requires flight in today’s life and that evolutionary workings—redundant from natural selection—have to be re-evaluated. According to him, there is no source of threat as humans do not live in “the savannah” anymore. Ironically, the examples of Chicago and Algeria both show that cities are not exempt from danger. Thus, Thassa is a refugee who fled her home country Algeria to Canada then to the United States because of the attacks on Kabyles in Algeria. The example shows that flight and a sense of danger are still critical to human survival—even when humans constructed cities and states around them.

Analogously, other so-called “negative feedback”—such as frustration, dissatisfaction, anger, and revolt—could be useful in determining a decisive reaction against an enemy, an oppressor, a colonizer, and/or a terrorist (etc.). If human beings cannot express dissatisfaction, anger, or revolt against social, economic, racial, and gender inequalities and injustices as well as dictatorship or genocide, then a change of situation, as a consequence, would not be feasible. Under the absence of such feelings there would be only consent to atrocities and static non-evolving societies, or the extinction of minorities and the oppressed. In his book *Better Humans? Understanding the Enhancement Project*, Michael Haus-

keller illustrates that enhancing humans towards more effective and productive beings may coincide with a definition of slavery (7).¹² In the absence of a “negative” affect, and through the feeling of what Kurton calls “sustainable satisfaction,” is analogically a creation of consenting slaves. Hence, the idea of enhancing humans to express only positive emotions does not come without adverse consequences. To further understand this, it is important to look at the interconnectedness of emotions.

1.2.2 Interconnections of Emotions

The novel calls attention to interconnectivity in emotional pathways and their cross-influence. As seen in the passage above, “mood brighteners” cause dull “fighter-pilot clarity.” This exemplifies an interconnection of emotions to one another, and to cognitive capacities. First, sadness could also be related to mourning, empathy, and compassion. Hence, the absence of the gene does not necessarily mean that there will be no frustration in not feeling the emotion, or not sensing the range of emotions linked to it. An interesting experiment on the removal of certain brain regions proves that the absence of a specific “brain structure” in an animal (one can assume the same for the human) causes complete imbalance. In his essay, “The Place of the Triune Brain in Psychiatry,” Detlev W. Ploog reveals that, through an experiment conducted by Heinrich Klüver and Paul Bucy around 1937–1939,

[t]he bilateral removal of the temporal lobes of macaques, including the amygdala and the hippocampal formation, caused severe changes in cognition and emotional behavior. The animals, formerly quite wild, became tame, showing a flattening of emotions, and exhibited remarkable oral tendencies (putting even dangerous objects, such as a live snake, into their mouths). They showed a compulsive tendency to take note of and react to every visual stimulus, but failed to recognize familiar objects. Most importantly, they exhibited an enormous increase in sexual behavior, including mounting of inappropriate objects and species. (Ploog, “Triune in Psychiatry” 488)

12 Cf. Allenby, Braden R. and Daniel Sarewitz, *The Techno-Human Condition*.

Some of the cerebral sections (i.e., the amygdala and the hippocampal formation) are assessed to be associated with emotions (488), the extraction of which proves a complete absence of a sense of danger and excessive response to stimuli, along with other cognitive and behavioral dysfunctions (e.g., agnosia).

Likewise, *Generosity* lists some antidepressants and their possible undesirable side effects. These are the now-banned MDMA (*Generosity* 98) and Rohypnol, which seem, as Russell's brother Robert puts it, to cause possible adverse conditions leading to sexually violent behavior (rape) (42). In addition, the novel implicitly refers to the antidepressant medication, Prozac. In Peter D. Kramer's book, *Listening to Prozac*, Prozac is reported to be somehow linked to instances of suicide (xiv). Nonetheless, Kramer gives a historical account of several antidepressants and insight into why Prozac was the best type of medication—despite the rumors of its deadly side effects. Other antidepressants, such as Xanax, as Kramer elucidates, cause addiction, inactivity, dullness, and/or low libido, heart palpitations, low blood pressure, extreme headaches, or hemorrhage and death (*Listening* 55–57, 86).

Drawing parallels to the previous examples (extraction of certain brain structures, or intake of chemical drugs), a strong relation exists between attempting to manipulate emotions and causing degrees of strange behavior that impact cognitive processes, responses, and actions. The removal of a gene responsible for sadness—if possible—could cause comparable symptoms in cognitive and behavioral reactions. A reverse enterprise was implemented; in a report on a cutting-edge experiment in biomedicine, Paul Biegler points to gene engineering conducted in China on a cloned macaque (Monkey A6) that underwent gene *BMAL1* removal, and which, as a result, now exhibits symptoms of depression and anxiety (“Leaps and Boundaries” 1). Biegler explains that the *BMLA1* gene elimination paves the way for human-like psychiatric disorders (1). He describes that—as the video shows—Monkey A6 now retreats to a corner in the cage and covers its face with its hands (1).¹³

13 Biegler stresses that China is the only country where a primate has ever been cloned (“Leaps and Boundaries” 1). Following the gene editing experiment on Monkey A6, in *Animal Welfare and Ethics*, Andrew Knight considered the practice “disturbing news” (1).

1.3 The Enhancement Paradox

1.3.1 Futuristic Enhancement

a. Already Enhanced

The use of the term “hyperthymia” in *Generosity*—which is a term coined by Peter D. Kramer—pushes us to rethink the use of antidepressants and the frenzy about drugs such as Prozac. Prozac is a selective serotonin-uptake inhibitor, which became popular in the United States following its introduction in December 1987 (Kramer, *Listening* vi; 64). Eight million of the US population—including both healthy citizens and citizens showing pathological depression—were already on Prozac less than five years after its introduction, with a rate of “650,000 prescriptions per month” (xiv; xvi). Since the introduction of Xanax in the 1980s, “panic anxiety” and “panic attacks” emerged, with a surge in numbers of clinically diagnosed cases, becoming suddenly a widespread personality disorder in the United States (77; 85). More and more people in the United States then took different types of antidepressants until the introduction of Prozac, which witnessed a peak in healthy people’s use of mood enhancers. This phenomenon matches the high rate of characters in *Generosity* who are on antidepressants, who tried them at least once, or express interest in doing so. As the following excerpt elaborates: “She [Candace] felt the full, desperate desires of a populace 58 per cent of whom needed some kind of chemical intervention just to manage” (*Generosity* 98). Besides, Russell carries a kit of antianxiety pills and possible pain killers, including Ativan and doxylamine (313). Kurton tried some but did not appreciate the outcome; Russell’s brother Robert is on Ativan; and, according to Robert, the whole family shares depressive genes (*Generosity* 42–43).

Generosity trespasses the boundaries of understanding of pathological sadness in many more instances. The following passage is another example that makes the issue of mood imbalances even more global: “A week ago, the city was in a blast kiln. The temperature has dropped from ninety to sixty in four days. Seasonal affective disorder: the entire spinning planet must be bipolar” (81). The narrative continues, on a more tragic note, to the shockingly high occurrence rate of suicide:

Then comes the next classroom scene. From Friday to Monday, ten suicides have succeeded in metropolitan Chicago, six of them the result of mood disorders, the second-leading medical killer of people Stone's age. From the time he says goodbye to Thassa in the college cafeteria until he sees her again in next week's classroom 287 people nationwide take their own lives. It's number three in Harmon's list of most frequently used plots. (87–88)

In this respect, *Generosity* generalizes the broad effects of depression, and it draws attention to the shockingly high numbers of suicide.

Kramer himself explores the ethical implications connected to prescribing Prozac to both pathologically depressed patients and healthy patients, reflecting on how Prozac changed the perception of the “self” — or rather the “altered personality” — that best fits the competitive mode of modern society (*Listening* 17, 20–21). Indeed, Kramer does not hold sadness in a high level of esteem, and he refutes the appreciation of sadness under a “false” connection to “authenticity” or creativity in the arts and literature (*Listening* 20; “Valorization” 16–17). Therefore, he does not see the ill in helping people to “feel better than well” or to feel “themselves” (*Listening* 19). Kramer gives examples of how non-pathological patients could achieve relational and professional success when taking the pill, which boosts their energy, self-confidence, effectiveness, assertiveness, and decision-making skills in a “hyperthymic” sense (17; 57). One understands from Kramer's examples that there is no ethical advantage in undergoing unnecessary pain if it could be avoided—which actually constitutes the core argument of the scientist Kurton in *Generosity*. Reaching the “authentic self” was thus presumably a highlight of the “enhancing” pill. Within the debate over the moral use of Prozac on non-pathological patients, Kramer considers Prozac to be a “clean drug”—in comparison with other antidepressants on the market and those produced in the past (*Listening* 57). Therefore, he labels it “cosmetic psychopharmacology” that alters, or rather enhances, “melancholic personalities” (“Valorization” 13; *Listening* 15; 57). Frenzy about constant happiness and hyperthymia similarly defines the reaction of the society in *Generosity*. In the novel, the reality TV show followers, who learn about Thassa's natural hyperthymia on tele-

vision, see her trait as a prophetic gift. In reaction, they start treating her as an angelic “messenger” and begging for her blessings for positive vibes (*Generosity* 226). In *Generosity*, the human pursuit of happiness is equated to a desperate craving for joy and a lack of sadness is translated into a divine miracle. The novel is, therefore, overloaded with references to the surge in methods, stressing mass production of self-help from positive psychology to “confessional” blogs and mystic sources. In a uniform manner, Russell joins the pool of writers on the topic, and finds an online self-help magazine (with member contribution) under the title, *Becoming You* (*Generosity* 18). The title, in turn, echoes the Prozac-related motto, “I feel myself again.” However, instead of a positive psychology book or an enhancing pill, Kurton pioneers genomic sequencing. He suggests genetic engineering technology be implemented on gametes to erase pathological and non-pathological sadness and to create happier offspring—i.e., healthy future generations.

b. Cultivating Thassa’s Image in *Generosity: An Enhancement*

In these several distinct manners and methods of cultivating happiness and the “authentic self,” Thassa’s image becomes in turn cultivated—through her hyperthymic condition. Thassa is described to be a 23-year-old refugee of Algerian origin and Amazigh ethnicity (*Generosity* 28; 51). Her attitude sparks curiosity in all of the people who come to her “live” or through a virtual encounter, including her teacher, classmates, media reporters, Kurton, and the community. Russell Stone reflects on her appearance and exceptional elation as she walks late into class for his second session: “She’s shorter than Stone thought. She’s wearing a kind of needlework, coral-colored shift. She could be from southern Italy. But her round face shines with precisely the light he remembers, the flushed look announcing that the most remarkable thing has happened to her, just now, down this hall, outside this building, on the streets of this improbable city [...]” (27). In a similar level of being impressed by her fresh aura, her classmates—who seem to be all “addicted to the woman’s elation” (35)—give her nicknames: first “Dalai” then “Miss Generosity” (28).

The spell continues in Russell’s class, and Thassa’s unexplained extremely “positive” temperament constructs a state of multi-fictionality around her image. The creative writing teacher observes his students

and interprets their lack of initiative as “just soaking” in Thassa’s “glow” and “her eerie contentment” (27). He even wonders whether they “shuffle their journals, glancing sidelong, checking to see if they’ve made her up” (27). Drifting Thassa’s persona into a multi-strata of fictionality—as a character in the novel and as fantasy in the students’ journals—signals various phantasmagoric imaginations of hyperthymia and gene engineering technology. In such an imagination, “[h]appy people must *know something* that no one else does. Some key to being alive, obscure and hard-won, almost out of reach. Otherwise, he would have met a truly happy person or two, long before her” (*Generosity* 52).

For Russell, Thassa becomes an object of obsession and the specimen of experimental thoughts. She constitutes the origin of questioning melancholy—the starting point and the ending point of his investigation of books and theories on happiness: “He lifts up his eyes from the page to wonder whether the Algerian woman might be experiencing massive anesthesia from post-traumatic stress disorder. Maybe her free-floating ecstasy might signal a coming collapse. But in all the hours he’s spent in her presence over recent weeks, the lowest she’s ever descended to is mild amusement” (*Generosity* 71). In a follow up to his own speculations, Russell inquires about the term “hyperthymia.” He discovers, in one source, that it resides in a “bipolar disorder” that comes with “cyclical” “hypomania”—where one is “life-enhancing” and the other is “deadly” (*Generosity* 72–73). Upon such knowledge, he starts to believe that Thassa “has something that should be looked at” and that he urgently “needs to consult a real professional” about her condition (73). Russell’s curiosity underlines intrigue and the impossibility of grasping Thassa’s unique liveliness. He ponders:

[...] both of Thassa Amzwar’s parents are dead. [...] And the daughter [Thassa] is either on newly discovered antidepressants or so permanently traumatized she’s giddy. Her writing has that open confidence of a child who might still become an astronaut when she grows up. All her sounds ring, all colors shine. Crippling colonial inheritance, religious psychosis, nighttime raids: she’s swept along by the stream, marveling. Her clauses sprout whatever comes just before wings. (32; [*my omissions, my additions*])

The suspicion and doubts about the stability of her state are equally enacted in her classmates' observations:

[...] One sketch [from Charlotte's portfolio], more sinewy than the rest, jumps out at Russell [...]: *It's like she [Thassa]'s glowing. Like she knows something. Makes me want to be a refugee.*

[...]

Charlotte tsks [...] Is there something broken with her? Or something really ... fixed?

'I don't know,' [Russell] mumbles. 'I've never met an Algerian before.'
(50; [*my omissions, my additions*])

What gains attention from Charlotte's conversation with Russell is her probing question: "So what do you make of her?" that is followed by her inquisition into Thassa's "broken/fixed" essence (*Generosity* 50). As seen in both Russell's and the classmates' remarks, the more Thassa's elation is cultivated, the more her refugee situation and Algerian identity becomes romanticized.

Indeed, her absolute "lack of depressive realism leaves her a walking target" (50). The idealization of Thassa amplifies. It reaches a peak via the media and public opinion—following Russell's confession that she seems hyperthymic. Consequently, Kurton adds to the excess of fascination. He immediately starts theorizing about her genes, promoting them to be the promise of future generations. Here, the cultivation of happiness takes another form: that of the magical. Under this light, the name of the TV program: "The Genie and the Genome"—a possible reference to Aladdin's genie of the lamp in *One Thousand and One Nights*—spins Kurton into the granter of humanity's dearest wish, and it positions continuous elation into the paradox of the realizable (unattainable) dream. The cultivation of Thassa/happiness, however, undergoes irreversible damage when the community rushes into "bipolar" judgments: first taking the naturally hyperthymic Thassa for an angel; and later, completely flipping sides and calling her the devil for accepting selling her ova to the Future Families Fertility Center Houston.

1.3.2 The Debate of Indecision

In *Generosity*, controversy over the enhancement project (that is represented by Kurton) is staged on the set of a science TV show: “The Genie and the Genome.” The initiative focuses attention on quandaries and confusions. It reveals extreme views between optimistic aspirations and total rejections of the futuristic plan for healthier humans. Donatello starts:

Enhancement. Why shouldn't we make ourselves better than we are now? We're incomplete. Why leave something as fabulous as life up to chance?

[...]

Another face fades in from the void, a big, gruff, empirical Friar Tuck.

Insane? No, I wouldn't say Thomas Kurton is insane. I might say profoundly nutty. But Darwin was nuts too, right?

Tuck shrugs, and his shoulder ripple starts a whirlpool that washes him away. The smiling Donatello rises from the flood.

A lot of people think this is all science fiction. But then we live in a country where 68 percent of folks don't believe in evolution... (*Generosity* 21–23 [*my omissions*])

As the bioethicist Anne Harter interferes, she accuses Meliorists' priority to improve human beings of human life trafficking in ego-oriented ventures:

[...] Out of that spiral appears a woman [Anne Harter] [...], she declares: One-fifth of human genes have already been patented. You have to pay a license fee just to look at them. People like Thomas Kurton buy and sell genetic material like it's movie rights...

She turns into a sand painting that the wind scatters. Next comes a quick, cross-fade cavalcade of talking heads:

He plays at life like it's a German board game...

The man made two fortunes by the age of thirty-five...

It's not really about profit, for Thomas. It's about ingenuity...

This is not your grandfather's scientific method...

The British Bloodhound [Anne Harter] returns to declare:
 He's driven by a massively dangerous altruism.
 Kurton fades back, his face morphing into other instances of itself:
 Superdrugs, smart drugs. Healthier people. Stronger people. Smarter people...

He turns into a watercolor, whose brushstrokes reassemble into Friar Tuck:
 You do know that Thomas is going to live forever?
 Thomas Kurton swims up again from the abyss:
 The first person to live to one hundred and fifty has already been born.
 The British Bloodhound pushes back a limp hand hair from her weary face.
 I don't want to live in his world. I do not look forward to the day when
 people will have to pay a royalty to have a child.
 Her pall gives way again to Donatello's daybreak.
 We're heading toward something glorious. Something better than
 anyone alive can imagine.

The close-ups relax into expansive midrange. A tall, bright woman in surgical scrubs strolls through a clean room at a biotech facility. She turns, removes her sterile cap, and shakes out a mass of flaxen hair.
 Is Thomas Kurton the villain in a morality fable gone terribly wrong? Or is he the hero of a noble experiment that's just about to pay off? No matter how the future judges him, he's already helping the present to spin...

Over the Limit. (Generosity 21–23 [my additions; my omissions])

The debate brings different voices into opposition (both opponents and proponents of human gene engineering). These pronounce hype and fears, as well as open interrogations into the field. Kurton is portrayed as a genius scientist, yet also as a greedy businessman, who is solely interested in profits—or in aggrandizing his image—that may arise from the research projects. Even though Anne Harter bashes his intentions, the rest of the guest speakers disagree with her. They hold him and his proposal in higher esteem, deeming it visionary. Thus, during the narrative, Kurton's identity is positioned in a discourse of imprecision; he is a villain or an altruist, it is left to the future to decide on his “over the limit” experiments.

As a matter of fact, Kurton does not aspire to stop at the threshold of eliminating depression. He targets the healing of aging and death in a similar manner. The scientist's cutaway talk from a conference on "The Future of Aging" at the University of Tokyo, which is broadcast as part of the show, argues the following: "The script that has kept us in gloom and dread is about to be rewritten. Labs across the globe are closing in on those ridiculous genetic errors that cause life to suicide. Aging is not just a disease; it's the mother of all maladies. And humankind may finally have a shot at curing it" (*Generosity* 61). He continues in total self-confidence: "Cure aging, and you beat a dozen ailments at once. You might even help depression" (62). Furthermore, in response to the attacks from the fictive ethicist Anne Harter, Kurton claims that "People want to live longer *and* better. When they can do both, they will. Ethics is just going to have to catch up" (63). In fact, Kurton has even taken measures to have his corpse preserved once he passes away, in the hope of the development of a more active engagement with Creation—and therefore of achieving resurrection, or putting an end to death:

Close-up on his right wrist: a red medical alert bracelet instructs the finders of his dead body to act quickly, administer calcium blockers and blood thinner, pack his corpse in ice water, balance its pH, and call the 800 number of a firm that will helicopter in paramedics to begin cryonic suspension. (*Generosity* 24)

In *Generosity*, and as seen in the above discussion, happiness, resurrection, and genes appear as products that could be generated artificially and assigned a monetary value—marking the peak in consumerism. In her article "The Pursuit of Happiness 2.0," Heike Schäfer points out the commodification of happiness. She situates the discourse about "the genetic upgrade" within consumerist culture, which commercializes "all the aspects of life via TV and digital culture," on the one hand, and promotes "a cult" of unique "authentic self" and "first-hand experience" on the other (267). In the process as she puts it, "as self-cultivation" focuses solely on "self-improvement," enhancement transforms into a "normative imperative and marketing tool" (267). Consumerism reaches a peak when Thassa's ova become a target for auction (*Generosity* 258; 271). As

she decides to sell them for Houston clinic for \$32,000, Kurton sues the fertility clinic and demands \$800 million, claiming intellectual property rights to Thassa's genome because his biotech company, Truecyte, has conducted the studies on Thassa (271).

The more awe and fascination Thassa inspires in the people around her, the more distress the situation causes her. However, the incentives behind Thassa's suicide are not made clear.¹⁴ Some possibilities may be accounted for: Thassa's loss of right to ownership of her own genes; the pressure from public shaming; imbalance that might have arisen as a secondary effect to Kurton's experiment; or the flip side of hyperthymia resulting in fatal hypomania. Other justifications may be due to her repressed traumatic past with an accumulation of present problems; or in a totally opposite hypothesis, Thassa's suicide is genetically pre-determined. Thus, in the genetic logic, Thassa appears hyperthymic despite her traumatic past, and suicidal even though she is ecstatic. Nevertheless, the absence of clarity is largely intentional as most suicides remain a riddle. For instance, in *Listening to Prozac*, Peter D. Kramer questions the claim that Prozac is the reason behind the suicides of patients who are administered the medication. Still, the inexactitude remains remarkable in Thassa's example and Kramer's account.

Another understanding (as Karin Höpker offers) translates the causes into a lack of adjustment or "coping" skills:

[...] In the end it is Russell's medical kit which Thassa, distressed and desperate beyond the reach of her congenital good spirits, uses for her suicide. Displacement from the familiar range of her own moods by the epistemic violence of a society which rejects her ungovernable otherness, she resorts to the final remedy of Russell's hoarded stack of sedatives, pain-killers, and anti-depressants which he carries around largely unused like a symbolic charm of ethopolitical prevention in time of personal crisis. Thassa seemed helpless once her general state of happiness

14 In their respective articles: "The Multiple Functions of Richard Powers' Fiction," "The Pursuit of Happiness 2.0," and "Happiness in Distress," Heinz Ickstadt, Heike Schäfer, and Karin Höpker each offer a different understanding of the suicide scene and its reasons, as well as *Generosity's* end, highlighting the complexity of these sections and possibly an intended imprecision.

had ceased to buoy her, illiterate in any of the techniques of bracing oneself against feelings of anxiety, misery, frustration or depression, which other people acquire early on as everyday strategies of coping and survival. [...] (Höpker, “Happiness in Distress” 299)

Such analysis, however, misplaces the blame onto the victim for not being able to survive social harassment. Not to forget that, in an earlier stage of the narrative, Thassa escapes an attempted rape by her classmate, John Thornell (*Generosity* 122, 124). Although the incident does not seem to disturb her, or result in a breakdown, as the narrative unfolds—it should not be neglected either (122).¹⁵

In many cases, enhancement is considered unnecessary and unethical, relegated to a taboo zone. Proponents of genetic editing usually promote genetics under the condition of its curing purposes—also they are very careful of implementing experiments on humans as the consequences of potential mutations are still not predictable (see Doudna). By including the term “An Enhancement” in the title of the novel, Powers intentionally stresses the enhancing dimension. However, although Kurton suggests targeting genes that are non-pathological in the classical sense of the term, his argument fuses both enhancement and curing. Whereas the latter is usually accepted as noble, the first is considered to be an attempt to interfere with divine creation, or with biological essence and the course of nature. Resentment—as seen in *Generosity*—fuels the social revolt against Thassa’s selling her reproductive cells for Houston Clinic’s experiments.

In his article, “The Evolutionary Implications of Human Genetic Engineering,” bioethicist Russell Powell contends that not all types of genetic variants are desirable for human beings—despite the biodiversity argument (210). Powell explains that opponents of enhancement assume that genetic engineering technology (GET) poses a threat to human viability (205). Opponents hold that GET endangers existence through the eradication of genetic variations in humans, creating species that are vulnerable to evolving pathologies (205). He elaborates

15 Rape occurs as a motif as well in the suicidal case of the character Hannah Baker in the American streaming series *Thirteen Reasons Why* (2017).

that GET opponents base their arguments on the Irish potato crop failure of the 19th century and the wine failure in Napa Valley due to the creation of the “monoculture” through agricultural selection of “a single cultivated crop” (205). Indeed, “genetic uniformity” augments the risk of batch disruption: on the one hand, “genetically homogenous populations” show more vulnerability to “large-scale epidemics,” on the other hand, a lack in biodiversity inhibits “the flexibility of cultivar lineages” to “environmental conditions” (205). Nevertheless, Powell suggests that the eradication of genetic variations is far from possible in humans (210). He argues that an aspiration to annihilate some of the unwanted variations could be more beneficial for human survival rather than harmful and causing extinction (210). With this, he means genetic markers that lead to “functional disintegration” as in the cases of neural degenerative conditions, cancer, and recessive diseases (211).

The fact that genetics is a nascent field complicates the decision to be in favor of, or against, genetic interventions, especially in humans. Scientist He Jiankui¹⁶ announced in November 2018 that he had deployed the CRISPR technique on human babies in Shenzhen, China, claiming to have modified genes in the twins Lulu and Nana—when still at the embryo phase—to make them resistant to human immunodeficiency virus (HIV), due to the father’s infection (“Leaps and Boundaries” 1; “China’s Win” 1).¹⁷ The news caused outrage among bioethicists and scientists equally; they alerted against the unethical breach of “international” laws, and they warned against potential unknown mutations that may occur following such procedures and that may imperil the human species. In the midst of the global scientific and technological race, the quandary translates to whether China has to impose stricter rules on research, or whether the United States needs a “sputnik” effect to take more initiatives in biotechnology and biomedicine (“Leaps and Boundaries” 3; “Doctors in China” 9). Nonetheless, according to Biegler, several Chinese scientists expressed their discontent with He’s experiment (“Leaps and Boundaries” 3); and bioethicist Jing-Bao Nie cau-

16 He Jiankui. “About Lulu and Nana: Twin Girls Born Healthy after Gene Surgery as Single-cell Embryo.” 25 Nov. 2018. *The HeLab*. <https://www.youtube.com/watch?v=thovnOmFltc>.

17 It is not clear until today whether He Jiankui’s experiment took actually place or whether he spread false information.

tioned against a eugenic discourse (3). Concerns continue to amplify as monkeys were “bred” “with the human gene MCPH1” in April 2019, causing them to exhibit a more efficient memory and quicker “reaction times” (3).¹⁸ As Paul Biegler and Hallam Stevens see it, a gap does exist between the United States and China in policies and views on how fast, or strictly, to implement gene editing technology in humans—or even primates (“Leaps” 8; “China’s Win” 5).

Generosity: An Enhancement captures well the dilemma within scientific and public discourses; and it touches upon interesting points of discussion that underline the different facets to consider. Although there has been a lot of development and change in techniques and tools for gene manipulation—enabling simpler and more precise interventions in eliminating, replacing, or deactivating a gene—still scientists across the nascent fields (of biomedicine and biotechnology) face many challenges. Genomics reveals interconnectedness of the genetic network and better identification of dysfunctional genes. However, no gene editing tool can ensure control over mutations, especially following germline modification. Kurton’s premise is situated exactly in such a problematic condition; and *Generosity* stages well the issue by involving the different perspectives and by moving the laboratory to reality TV. In addition, the novel underscores another dimension as it rethinks writing at the heart of the four remarkable changes in the United States (and globally) in the 1990s: regarding antidepressants, reality TV, blogs, and genomics.

1.4 Editing is the New Writing

In the era of reality TV and weblogs (both text and video based), *Generosity: An Enhancement* reveals a focus on the reality TV show editing process, which interweaves the narrative sequence. In parallel, Russell Stone—who is the teacher of a creative writing class—thinks about surfacing methods of writing and the transformation towards online contributions that are marked with a copy-editing phase. Schäfer indeed treats the editing aspect of writing in *Generosity* as an aspiration to

¹⁸ The experiments were conducted under the supervision of Bing Su at the University of Chinese Academy of Sciences in Beijing (“Leaps and Boundaries” 3).

enhance the novel (Schäfer, “Pursuit of Happiness” 264). However, she limits the focus to the imitation of the process of gene manipulation, and she offers a poststructuralist perspective that is embedded in the phrase “the season of revision” (269). Nonetheless, she also explores the limits of “postmodern metafiction” in the novel and how it transforms into “the paradox of ‘creative nonfiction,’” and therefore “post-postmodernism” (275–276). Hence, the sub-chapter here connects the references of blogs, reality TV, and gene editing as they expose—in relation—additional experimental channels.

The passages relating to the science TV show produce the narrative in a format that captures the editing. They read like post-production techniques, revealing cuts and shifts in scenes, but also peeping into the different screens as seen in the following:

Establishing shot: a crazy-cantilevered, glass-skinned building near Kendall Square, Cambridge, one of those prestige-designer palaces that look like the solution to a logic puzzle.

Interior: the big-windowed corner office reserved for high-volume grant winners. Ambient sounds of wind and trickling water fill the room. On a five-foot-wide LCD panel across one wall, wild landscapes cross-fade into one another.

Close-up: Thomas Kurton seated behind a swept-wing desk that looks invisible to radar. A complex pneumatic chair props up his spine. His hands work with the detachment of someone throwing the I Ching. More screens dot the glass desktop. He speaks into one, brushes two fingers across another, dragging data in changing formation across the parade ground. (*Generosity* 23)

The writing process comes to the fore, especially through Russell’s continual struggle with writing and through his class. At a certain stage, Russell works as an editor instead of a writer and ghost writes “semi-literate” blogs of amateur authors (19). He also edits a “self-improvement magazine called *Becoming You*” (18). Russell therefore becomes a writer by proxy, ghost writing online contributions from random users to embellish their amateur style in a “post-publication” phase.

The unscripted amateurish style becomes edited and so goes Russell's writing career. Russell stops producing books (which are based on real stories), and calls his class "creative non-fiction," attracting students interested in blog formats and self-video sharing. He observes his students' writing samples and the new form of "confessional" and "subscribed-generating" writing. The narrator notifies:

But even as he shrinks from it, the world graduates to runaway first person. Blogs, mashups, reality programming, court TV, chat shows, chat rooms, chat cafés, capital campaigns, catalog copy, even war-zone journalism all turn confessional. Feelings are the new facts. Memoir is the new history. Tell-alls are the new news. (*Generosity* 13)

Russell ponders: "What would life be like, he writes, if art students finally had their revolution?" (*Generosity* 12).

In turn, the narrator/writer interferes with the story, interrupting the flow. Like a TV host, the narrator interpolates the narrative in *Generosity*. The passage reads as follows: "Russell Stone does not answer his own question. I watch him trying to decide no more than God" (*Generosity* 12). Then the narrator (surfacing as author) interferes and uncovers the process of writing as editing:

I give myself a first assignment: Russell Stone in one hundred and fifty words.

Start with this: His earliest crime [...]

He'd be pleased to know that in my mind, he's still mostly white space. (*Generosity* 12–13; [my omissions])

In *Generosity*, all characters (representative of fields or epistemological connotation) exist outside of their "usual" frame: Thomas Kurton, the scientist, is outside of the laboratory and is portrayed to be on the TV platform; Tonia Schiff tries to report on Algeria, but the closest she gets to the country consists of standing in the bordering town of Tunisia: el-Kef; Russell Stone edits amateur "semiliterature" instead of writing his own books; and Thassadit Amzwar is a refugee, displaced

from her own country. The characters are removed to a proxy space of their function or belonging. In parallel, the displacement equally occurs in disciplines: science is staged on reality TV shows; genomics appears in fiction; and technology embraces biology. The shift comes along as forced, intentional, or driven by the flow. In order to “make writing alive,” Richard Powers edits his novel’s literary DNA with biotechnological jargon and embarks on a discussion of the future of the human, life sciences, and the novel itself. Hence, human genetic editing (staged on a TV reality show in *Generosity*) in turn infiltrates writing as editing. Indeed, Jennifer Doudna likens the achievements of editing the genetic code in organisms to the essential practice of text modification in a writing process (*A Crack in Creation* xiii).

By focusing on the critical emerging platforms and discussions of the 1990s, *Generosity: An Enhancement* flips writing into engineering that probes serious genomic issues and interrogates the implications of affect in the biotechnological context. As DNA screening has enabled a peep into various human DNA samples and mutations—detecting specific functions that inform characteristics, behavior, emotions, and disposition to degenerative diseases has opened a door into brain scrutiny under genomic technologies and tools. The next chapter, therefore, continues the conversation on affect and brain functions through another nascent field, that of cognitive studies.

Chapter 2 Scientific Evolution: Brain Plasticity in *The Echo Maker*

Chapter 1, Genomic Network in *Generosity: An Enhancement*, explores artificial evolution through human gene engineering. The chapter focuses on the claim of modifiable affects (i.e., emotions) through gene editing, and addresses the deep connection of genes to emotions as seen in *Generosity: An Enhancement* (published in 2009; [setting 1990s]). Chapter 2 Scientific Evolution: Brain Plasticity in *The Echo Maker* carries on the inspection of artificial evolution with a twist of focus embedded in *The Echo Maker*'s exploration of cerebral malleability. *The Echo Maker*, published in 2006, offers the different setting of Nebraska in 2002, and a different perspective on the study of affect that is embedded in brain structures. The novel treats cognitive delusional diseases with a strong focus on Capgras syndrome—and hints briefly at prosopagnosia and phantom limb disease. By so doing, it explores the interconnectedness of emotions and cognitive capacities in the human brain. Here, the brain takes the shape of complex dynamics and structures, highlighting opposing methods in scientific research and in medical interventions that are suggested to treat such rare syndromes. The different perspectives, held by the various characters in the novel—including the two doctors: Dr. Hayes and Dr. Weber—voice the gaps and shifts in scientific approaches.¹⁹ The narrative sketches cognitive evolution. In addition, it implicitly compares cognitive capacities in humans with those in migratory bird species, known as cranes.

The Echo Maker traces a radical deterioration in Mark Schluter's life as he nears death and falls into a coma, following a truck accident that causes him brain injury. Mark then goes through a slow and incomplete

¹⁹ In "Echos, Doubles, and Delusions: Capgras Syndrome in Science and Literature," psychologist Douwe Draaisma offers a detailed study of how the two doctors represent two different schools of diagnosis of Capgras. Draaisma emphasizes that Dr. Weber stands for the period of 1923–1980 and argues that Dr. Hayes represents the current mainstream (431). I believe that Dr. Weber represents the cognitive neurological approach. I situate the argument of the split of theories within J. Capgras and Vilayanur S. Ramachandran because of the focus on brain plasticity and the organic aspect of the disease. I, therefore, tackle brain architecture.

recovery in a simulated form of cerebral evolution from vegetative state to slight improvements, until stagnating in a condition of Capgras syndrome that seems irreversible. The events unfold mainly in Nebraska around 2002. The story revolves around Mark's delusion of thinking his sister, Karin, is an imposter. In parallel, it captures Karin's struggle to aid her brother in having his affective perception (and "previous real self") restored. In this respect, light is shed on the complexity of brain functions and structures, as well as the progress and limitations of scientific research in understanding cognitive capacities and rare dysfunctions. It highlights not only entanglements of perception and emotions, but also the complexities of unconsciousness, consciousness, and self-consciousness—in the human (both with delusional and healthy brains) and the animal.

In recent studies (starting from the 1980s) and in *The Echo Maker*, Capgras syndrome has been defined as a neurological degenerative delusional disease where affective perception is altered (Ramachandran; Ellis & Lewis). The major symptom of the disease resides in the patient's inability to recognize a relative (sibling, parent, spouse, or child)—taking them for a double, or an imposter instead (Capgras & Reboul-Lachaux; Ramachandran; Ellis & Lewis). Therefore, among the category of rare neurological diseases, Capgras helps us to better understand the connection between perception and affect, and thus the intricate relation between cognition and affect. In the case of Mark Schluter, in *The Echo Maker*, another element is highly important and that is the truck accident. The accident gives a medical alternative to the Capgras diagnosis as neurological, caused by external physical trauma to the brain through brain injury. Therefore, in this case, it is considered non-inherent and non-psychological—as opposed to the traditional theory. The case, however, does not bring genetics to an end (which is the major focus of *Generosity*). It raises interest in external factors that result in radical change, or disturbance, in brain functions. This highlights a need to consider brain studies and their relation to affect, on the one hand, and, on the other hand, it brings forth cognitive studies and a complex brain architecture.

Traditionally, the case of Capgras was accounted for as "a *female disorder*," induced by psychological trauma and explained through an

oedipal complex (Draaisma 432; Ramachandran 161). Therefore, in the narrative choice in the case of Mark in *The Echo Maker*, the truck accident constitutes an important element since it evokes a shift in medical theory concerning the disease. In modern scientific research, the factor of the accident is what neurologist Vilayanur Subramanian Ramachandran uses in his cognitive neurological study. He, therefore, rethinks Capgras as neurological, and organ oriented (instead of psychic), by establishing that the cause is physical injury to the brain (Ramachandran 161–162). In their essay, “Capgras Delusion: A Window on Face Recognition,” Hadyn D. Ellis and Michael B. Lewis elucidate that Capgras delusion marks a split in diagnosis (149). Whereas cases mostly exist in relation to paranoid schizophrenia—and they are examined in psychotherapy—with the cases caused by accidents, the disease takes a different turn (149). Its existence in “neurological, toxic, and organic conditions” positions the delusion among the nascent field of cognitive neuropsychiatry that questions the traditional theories (149). Therefore, *The Echo Maker* plays with such implications, conflicting theories and diagnoses; and although it includes the paranoid discourse, it embeds the narrative within theoretical crossroads and shifts towards cognitive neuropsychiatry. Therefore, as a male patient suffering from Capgras following an accident, Mark’s case deviates from traditional thinking and falls under the modern trend instead. The novel, therefore, offers an intricate view on the paradigm shift in Capgras diagnosis from a psychic to a neurological degenerative delusional disease.

Capgras syndrome was first discovered by French psychiatrist Joseph Capgras in Paris in 1919 with the first patient referred to under the pseudonym Mme M., who seems to have developed the condition during—or in the aftermaths of—World War I. There are a lot of distinctions between the Capgras case study of the patient Mme M. and the fictive case of Mark Schluter in *The Echo Maker*. Although Mark is fictional, the disease itself and the symptoms are not. Strange as they may sound, the Capgras delusion as well as prosopagnosia and the phantom limb are revealed to a reader—who is not familiar with these neurological delusional diseases—as the fruit of the imagination in a twisted plot on human brain capacity.

The importance of Capgras (with its shadow topics in the novel: prosopagnosia and the phantom limb) lies not only at the heart of medical trends and branches (psychology and cognitive neuroscience) and their crossroads, but also at the heart of a philosophical treatment of its impact on the self within the literary narrative. Capgras, the brain, and the map become literary devices in the novel. Therefore, this chapter (Scientific Evolution: Brain Plasticity in *The Echo Maker*) explores human brain capacities, tracing brain delusion and evolution, apart from the shift in scientific approaches. For a better understanding of the specific elements that impact cognitive evolution, as treated in *The Echo Maker*, the following areas will be discussed: 1) brain intervention; 2) aspects of paranoia; 3) affective perception; 4) concepts of cognitive mapping; and 5) finally, “simulacrum.” By so doing, the chapter explores the narrative dimension that traces brain evolution, surgical intervention, and plasticity—which bring different levels of the unconscious and conscious.

2.1 Cerebral Interventions and Evolution

This sub-chapter delineates the different stages that Mark goes through. To begin with, it is crucial to take a close look at Mark’s state and to investigate his immediate condition following the accident. In a later stage, Mark undergoes physical and speech therapy. In the process, brain evolution is simulated. Mark transitions through each brain capacity—demonstrating, in accordance, corporeal and conscious strata. The shifts outline cerebral/corporeal stages, developing from feeble to comatose (vegetative); then from “reptilian” to “mammalian,” and finally, to Capgras-affected brain stages. The transitions stress artificial reversion (degeneration) and evolution in the brain, as well as the evolution of scientific schools from behavioral psychology (stimulus response) to cognitive neuroscience (see Tolman and Ramachandran).

Directly after the accident, Mark appears in the hospital hooked up to machines and cables for a survival that is assisted via artificial equipment. In this pre-coma condition, Mark is portrayed as “a lump of white wrapping,” exposing “bare skull sprouting wires” and “hard plastic eyes” as well as a “mouth pumped, without sound” (*Echo Maker* 7).

Mark lies at the threshold of life and death and is motionless—except for a difficulty in breathing, abnormal eye openings like those of a plastic doll, and a weak grip of the hand as a response to Karin’s voice. It seems in this passage that Mark still has some involuntary—along with faint restrained voluntary—motors in response to stimuli. The excerpt reads as follows:

They let her [Karin] into the unit to see him [Mark]. A nurse tried to prepare her, but Karin heard nothing. She stood in front of a nest of cables and monitors. On the bed lay a lump of white wrapping. A face cradled inside the tangle of tubes. [...] The matted hair gave way to a patch of bare skull sprouting wires. The forehead had been pressed to a hot grill. In a flimsy robin’s-egg gown, her brother struggled to inhale.

She heard herself call him, from a distance. ‘Mark?’ The eyes opened at the sound, like plastic eyes of her girlhood dolls. Nothing moved, not even his eyelids. Nothing until his mouth pumped, without sound. She leaned down into the equipment. Air hissed through his lips, above the hum of the monitors. [...]

His face knew her. But nothing came out of his mouth except a trickle of saliva. His eyes pleaded, terrified. He needed something from her, life or death. ‘It’s okay; I’m here,’ she said. But assurance only made him worse. She was exciting him, exactly what the nurses had forbidden. She looked anywhere but at his animal eyes. [...]

His hand stuck with an IV tube, reached up and grabbed her wrist. His aim stunned her. The grip was feeble but deadly, drawing her down into the mesh of tubes [...]. (*Echo Maker 7*; [my additions, my omissions])

As the events unfold, Mark slips into the deep unconscious state of coma. At this point, he deteriorates into a vegetative state, where he loses his conscious, voluntary capacities—as well as involuntary reactions—with zero response to outer stimuli. The doctors announce that he demonstrates “cerebral edema” as “something had spiked the pressure inside” his “skull” (*Echo Maker 8*). As they take Karin to see him again, “The person [...] lay comatose, his face collapsed into some

stranger's. His eyes wouldn't open when she called his name. His arms hung still, even when she squeezed them" (8).

Mark's situation—at this level—necessitates brain intervention through direct manipulation of the brain by means of advanced technology and medical operations. At first, Mark's body merges with cables and life machines like a trope for a cyborg. Then, the narrative exposes a stark scene of the surgery: cutting into the throat and skull, to intervene for survival artificially (i.e., scientifically and technologically) at a high degree of sophistication and complexity. The operation is described in a horrifying manner in the novel as follows: "they slit his throat and put a bolt into the skull" (9). In this context, science—as of medical interventions and surgeries, as well as the use of technological equipment for life support—fuses the line between death and life in the form of artificial resurrection through brain penetration and manipulation as a necessary element for survival in extreme cases.

The different evolutionary stages that Mark's condition navigates signal observations on conscious/unconscious states, voluntary/non-voluntary activity, and the stimulus–response connection. Life machines and surgery come out as direct penetrative input to the brain architecture. Following the operation, Dr. Hayes delineates to Karin the patient's brain parts and activity in a manner that is autopsy-like. The sketch reveals evolutionary biology and self-regeneration:

Dr. Hayes said that the fifteenth day was the point of no return. Nineteen-tenths of closed-head trauma victims who came back came back by then. "The eyes are good news," he told her [Karin]. "His reptilian brain is showing nice activity."

"He has a reptile brain?"

Dr. Hayes smiled, like a doctor in an old public health film. "We all do. A record of the long way here."

Clearly he wasn't from around these parts. Most locals hadn't come the long way. Both Schluter parents believed evolution was Communist propaganda. Mark himself had his doubts. *If all the millions of species are constantly evolving, how come we're the only ones who got smart?*

The doctor elaborated. “The brain is a mind-boggling redesign. But it can’t escape its past. It can only add to what’s already there.”

[...] “What’s his reptile brain... doing? What kind of nice activity?”

Dr. Hayes reeled off names: medulla, pons, midbrain, cerebellum. She copied the words into a tiny spiral notebook where she recorded everything, to look up later. The neurologist made the brain sound more rickety than the old toy trucks Mark used to assemble from discarded cabinet parts and sawn-off detergent bottles.

“What about his higher...? What’s above reptile—some kind of bird?”

“The next higher structure is the mammalian.”

Her lips moved as he talked, assisting. She couldn’t help it. ‘And my brother’s?’

Dr. Hayes grew guarded. “That’s harder to say. We don’t see any explicit damage. There is activity. Regulation. The hippocampus and amygdala, where some of the negative emotions, like fear, start.”

“You’re saying my brother is *afraid*? She waved off the doctor’s reassurances, thrilled. Mark was feeling. Fear or anything: it didn’t matter. “What about his...human brain? The part above the mammal?”

“He’s piecing himself back together. Activity in his prefrontal cortex is struggling to synchronize into consciousness.”

She asked Dr. Hayes for every pamphlet the hospital had on head injury. She underlined all the hopeful suggestions in green fine-line marker. The brain is our last frontier. The more we learn about it, the more we see how much more there is to know [...] (*Echo Maker* 16–17)

Succeeding in the brain surgery, the doctor evaluates Mark’s overall status as promising, despite the factor of uncertainty in the results. Dr. Hayes observes activity in the reptilian brain, the mammalian according to him is harder to assess although the “hippocampus and amygdala seem intact.” Importance at this stage is especially given to the brain, and this remains the case for the whole novel. While *Generosity: An*

Enhancement stresses the importance of a different field of studies by exploring human genetic engineering, *The Echo Maker* instead investigates plasticity in brain structures. The hospital pamphlets that Karin consults claim that “*The brain is our last frontier. The more we learn about it, the more we see how much more there is to know*” (*Echo Maker* 17). The statement finds its limits (as revealed in *Generosity*) since genetics adds to the spectrum of infinite knowledge.

The naming of the different brain regions as reptilian and mammalian in the novel, draws attention to physician and neuroscientist Paul D. MacLean’s theory of the Triune Brain, where he classifies the brain according to evolutionary hierarchy, distinguishing “three types of systems in the mammalian brain” which are a protoreptilian, a paleomammalian, and a neomammalian brain” (Ploog 489). In his article “The Place of the Triune Brain in Psychiatry,” Detlev W. Ploog (German psychiatrist, anthropologist, and primate behavior researcher) summarizes MacLean’s three structures of the brain as follows:

The protoreptilian brain comprises a particular group of ganglionic structures located at the base of the forebrain in reptiles, birds, and mammals [...] involved in the regulation of an animal’s daily master routines and subroutines, as well as the behavioral manifestations of species-specific types of displays used in intraspecific communication.

The paleomammalian brain corresponds to the limbic system [...] a common denominator in the brains of all mammals. In the evolutionary transition from reptiles to mammals, the three cardinal behavioral developments were (i) nursing in conjunction with maternal care, (ii) audiovisual communication for maintaining maternal-offspring contact, and (iii) play, which seems to be indispensable for the development of social behavior.

The neomammalian brain applies to the neocortex and the thalamic structures with which it is primarily connected. It is like an expending numerator, ballooning out progressively in evolution and reaching its greatest proportion in the human brain. On the basis of extensive connections with the visual, auditory, and somatic systems, it appears to be primarily oriented towards the external world. In human beings, it

provides the neural substrate for the linguistic translation and communication of subjective states accompanying various forms of mentation [...]. (Ploog 489)

Mark's slow progress somehow functions as a model for human evolution in an observable, short span of time under artificial direct stimulation. It evokes the process of long-term evolution, but revises Darwin's theory of natural evolution, stressing the efficiency of artificial intervention in modern evolution. It points out the fast process artificial evolution is reduced to, and shifts the definition of evolution, with the aspiration of moving purely natural evolution from natural selection to human-made intervention, under different modes of scientific and technological interferences. Jennifer Doudna trusts that CRISPR tools enable more control over random forms of natural selection and, according to Ray Kurzweil, for evolution to be efficient in modern times, it has to be conducted artificially in compressed, faster temporal frames, so as to ensure that humans' intelligence is not surpassed by machines.

Amongst confusing theories, Karin seeks out ways to rescue her brother and have his brain revived through outer auditory stimuli. As he starts to show signs of waking up from the coma, "she started talking to him again. Her words might focus his brain. None of the neurology books she pored over denied that possibility. No one knew enough about the brain to say what her brother might or might not hear" (*Echo Maker* 21). Therefore, she goes on reminiscing to Mark about their childhood memories to stimulate his mind. She not only relates the stories, but she also addresses him, by always starting with "you remember the bull snake?" "Remember Horace?" "Remember, when we washed him?" (22). However, the outcome, supposedly from stimulus-response and leading to Mark's awakening from the coma, shocks Karin. His movements startle her like a zombie's: "All at once, Mark started keening. One arm tomahawked and the other swung wide. His torso slashed upward and his head thrust out. Tubes tore off and the monitor alarm squealed" (22). As she calls the nurses in alarm they explain that "[h]e's trying to hug" her! (22).

The novel traces Mark Schluter's recovery through a long step-by-step progress, where it is interested in witnessing the different cogni-

tive functions separately. Even after his awakening, views continue to diverge on what could restore his brain. His friends Rupp and Duane claim that visits to the sick help stimulate brain chemicals of affection and happiness, whereas Karin thinks their presence agitates him. Duane argues that times of contact with friends “raise his serotonin levels” (*Echo Maker* 28). At this point, Mark regains his voluntary and conscious motor brain activities only feebly: he “threw [the ball of paper] the way a sailor-suited chimp might ride a tricycle” (29). Indeed, his rehabilitation exercises to start to walk again demand repetitive drilling. In parallel, his speech capacity improves from groans to repetition. The speech therapy requires him to copy basic sounds such as “Ah. Oh. Oo. Muh muh muh. Tuh tuh tuh,” which he cannot reproduce (34). With some progress, his speech formation reaches “echolalia,” as he echoes whatever he hears—without apparent thinking or correct syntax, in similar ways to a parrot (36–37). In the process and via drilling, Mark experiences major improvements—reaching a normal state—in all spheres (of speech, movement, and cognitive abilities), except for his affective perception that translates into his suffering from Capgras syndrome. A bigger part of the novel therefore embarks on the different dynamics that the rare delusional disease exposes.

2.2 Paranoia and the *Doppelgänger* Narrative

As explained earlier, Capgras syndrome is a degenerative delusional disease that causes agnosia, and specifically the inability to recognize the faces of loved ones (such as a spouse, a parent, or a sibling...). The patient strongly believes, instead, that the kin is an imposter, a *doppelgänger*. In the case of Capgras patients, memory of the very existence of the family member as well as memory of the relative’s facial traits are intact (Ramachandran 169). The recognition of the person as the original version of themselves is, however, impossible, which stems from “facial identification Agnosia” (Draaisma). It is thus not a disease that causes memory loss. Joseph Capgras and Reboul-Lachaux’s study link Capgras delusion to “errors of judgment” and “a mistaken interpretation”

(Capgras, “L’illusion des ‘sosies’” 126). In the first clinical case of Capgras (Mme M.), the delusion is described as “chronic psychosis which is hallucinatory, interpretive and imaginative” (119). The patient, Mme M., reveals “themes of the fantastic, delusions of royal grandeur, of substituting people around her and being in a state of psychic excitement” (119). Therefore, in “traditional psychodynamic explications,” the syndrome is intricately associated with paranoia (Ellis and Lewis, “A Window” 149; Capgras, “L’illusion des ‘sosies’” 119). Mme M.’s process of thinking concludes that there are enemies around that may make a double of her, her husband, her daughters, and other people in her circle. This judgment results in the patient believing that their kin is a copy in lieu of the original person, i.e., a “double” that replaces the supposedly abducted relative.

Since *The Echo Maker* navigates the shift between psychotic-based theory and organic-based theory in handling Capgras, it is interesting to see how the novel permeates the paranoia aspect—although it cancels it at the same time, as detailed later in this chapter. Therefore, a comparative study of both real (Mme M.) and fictive (Mark) patients analyzes the delusional *doppelgänger* narrative and its historical dimensions. While Mme M.’s symptoms reached a peak in post-World War I France; in *The Echo Maker*, the intensification of the paranoia in Mark goes hand in hand with a belief in a conspiracy theory in post-9/11 America.²⁰

Before the accident, Mark was addicted to propaganda: “He and his friends manned two dozen online avatars between them, talking Pig Latin to chatroom housewives, posting long comments on conspiracy theory blogs, uploading questionable images to crazedpics.com” (*Echo Maker* 29). As cultural sociologist Stef Aupers remarks, the conspiracy culture—starting in the 1970s—increased greatly in the United States after 9/11, as it was also promoted by the internet and mass media, spreading a non-pathological culture of paranoia (Aupers, “Trust No One” 23; 26). Capgras seems to have only increased Mark’s distrust to excess. He, therefore, transitions from exhibiting a “healthy” brain, marked with “addiction” to the spread of false news, to suffering from degenerative delusional agnosia (i.e., Capgras).

20 Very faint symptoms appeared following the death of Mme M.’s twin boys, and they increased a little around 1914 (“L’illusion des ‘sosies’” 120).

Present neurological research on Capgras syndrome departs from reflections of Joseph Capgras and Reboul-Lachaux, and tends to focus on the recurrent facial agnosia, treating all the story content as secondary. However, traditional methods—as seen in Capgras and Reboul-Lachaux—focused more on the paranoid aspect and delusional stories. Mme M. and Mark share the characteristic that their stories are imbedded in a post-war/post-attack state of emergency. During such circumstances, fear is generalized among the citizens, and panic is promoted through telecommunication technology and the media (telephone, telegraph, and the onset of radio in regard to WWI;²¹ and mass media as well as social media through 9/11). However, it is important to remember that Mark's Capgras originates from a truck accident causing his brain injury. The story context, used in *The Echo Maker*, is not arbitrary. It stresses the split in scientific approaches between the psychological (psychic) and the neurological (organ-oriented) trends—when it comes to Capgras syndrome.²²

Traditional methods focused on the paranoid aspect of the disease. Capgras patients tend to not only deem a kin a *doppelgänger*, but also craft a whole story around it. Such a tale is not taken as an artistic, creative narrative. Stories told by patients suffering from delusional diseases are rejected as pathological symptoms, since the “storyteller” (the patient) is not aware of the fictionality of their own story. However, certain elements in the stories that are recounted by the patients draw attention to some important realistic contexts. The “psychotic narrative” in the case of Capgras draws on some historical traumatic events happening, generally, not directly to the patient, but to a whole country in a state of panic, and then projected directly on to the patient in the form of a personal enemy. This evokes the pressure of the war of nerves that extends to the regular citizen.

Mme M.'s psychosis is aggravated in 1918 and draws on elements from World War I; some could be rumors others could be facts. Capgras and Reboul-Lachaux explain “On 3 June Mme M. goes to inform

21 “Golden Age of Radio in the US,” <https://dp.la/exhibitions/radio-golden-age/radio-frontlines>.

22 See also Douwe Draaisma, “Echos, Doubles, and Delusions: Capgras Syndrome in Science and Literature” (431).

the local police commissioner of the illegal confinement of a large number of people, particularly children, in the basement of her house and throughout Paris: she requests that two policemen accompany her to verify what she is saying and to free the prisoners” (Capgras, “L’illusion des ‘sosies’” 119). Furthermore, Mme M. was reported to have written a letter at the hospital about some enemies sending “doubles” to her, “... Daily, young girls came to me and daily they were taken away from me: I warned the police commissioner of the district of Necker, telling him that their parents had disappeared and that the little girls had little stitch marks on their faces, which were there to remove their thoughts, and that they had been maltreated...” (qtd. in Capgras, “L’illusion des ‘sosies’” 122).

Mme M. carries on specifying the period of World War I as the period of this child exchange and maltreatment, “This coming and going of children to and from my home lasted from 1914 to 1918 without a break” (qtd. in Capgras, “L’illusion des ‘sosies’” 122). Another element to keep in mind is that Mme M. had a son who died; then, she had twin girls, one of whom passed away; then, in 1906, she gave birth again to twins, who both died (Capgras, “L’illusion des ‘sosies’” 120). In this context, it is interesting to note that her delusion lies heavily on resemblance and doubles, as well as the disappearance of children. Mme M. writes further paranoid accounts about a shady trap plot in France, making all of Paris a scenario of doubles, filled with secret tunnels that produce imposters, pretending to be soldiers coming back from the war or causing people to vanish (123). Therefore, the disclosure parallels conspiracy theory scenarios:

The German fighter planes are firing blanks: there are no bombs, people are wrong to seek refuge in the cellars: many young girls are unable to get back out, as the opening is blocked up. The Métro is fatal for us, because the French and English armies have been put down there: the crisis of strength in the military arises particularly because of the disappearance of regiments underground, in the Métro... More people have disappeared like that [...] than have been taken prisoner. (qtd. in Capgras, “L’illusion des ‘sosies’” 123)

Analogous paranoia-based theories are given by Mark in *The Echo Maker*. However, in the personal interview, Richard Powers explains that Capgras is “an emblem of the estrangement that is affecting the entire human race” in not recognizing the kinship of “the rest of creation,” for instance cranes (Personal Interview). For him, cranes subvert “human exceptionalism” (Personal Interview). Here, I would like to generalize the argument and extend human estrangement to not only other species, but also to the diverse ethnicities, races, and religious identities. This can be seen in racial or cultural exceptionalism. By denying human kinship to diverse groups of people, humanity irrationally takes that which is different for an enemy. Therefore, apart from human exceptionalism over other species, *The Echo Maker* questions humanity’s exaggerated mistrust. It objects the casting of people, belonging to a specific group, as enemies by highlighting the irrational fear behind it.

2.3 Affective Perception: Neurological Understanding

The nascent field of cognitive neuroscience deviates from Freudian-based psychiatry in analyzing Capgras. Actually, what marks the shift of the novel’s focus to cognitive neurological trends are two major elements: first, Mark’s accident—as already treated in-depth; second, the crucial detail of him not recognizing his dog. Indeed, according to V.S. Ramachandran, one third of Capgras cases occur following brain injury from an accident, making the delusion organic and neurological, rather than solely “spontaneous” based on a “Freudian explanation” (*Phantoms* 161). For him, the very fact that some patients develop agnosia towards their dog constitutes the cue that totally dismantles the oedipal complex explanation (161); and this is what *The Echo Maker* adds to the plot by borrowing the dog incident. Ramachandran—and several other neuroscientists—incline, therefore, towards the new approach to diagnosing the disorder, and they stress the connection between affect and perception, that according to Ramachandran lies exactly within the “neurological pathways concerned with visual recognition and emotions in the brain” (*Phantoms* 162). In Capgras syndrome, according to Ramachan-

dran, a disconnect occurs in the brain area responsible for discerning familiar faces and the area responsible for generating “emotional responses” to those faces (162). The disconnect causes an affective perception disorder rather than errors of judgment or interpretation (162).

In their essay “Capgras Delusion: A Window on Face Recognition,” Hadyn D. Ellis and Michael B. Lewis analyze the differences between two delusional diseases that concern facial agnosia, Capgras and prosopagnosia, in order to understand the dynamics of conscious/unconscious facial recognition that underlie the neurological disorder.²³ Whereas in Capgras the patient still recognizes the familiar face (but as a double), patients with prosopagnosia completely fail to recognize any familiar faces at all, or faces in general (Ellis, “The Emotional Impact” 88; Draaisma 434). Following the theory of affective perception, the diseases open the gate towards the understanding of apparent and concealed dynamics by testing skin conductance to validate the absence, or the existence, of the unconscious emotion connected to facial agnosia. The findings of the experiments on skin conductance show that Capgras patients do not exhibit the “unconscious” reaction, although they demonstrate “overt recognition (as double),” which is reversed in prosopagnostic patients as they exhibit “covert skin conductance,” although they overtly fail to recognize the faces (Ellis, “A Window” 150).

Hence, *The Echo Maker* places a dynamic play on the conscious, unconscious, and self-conscious, as seen in sub-chapter 2.5. Studies on rare neurological diseases like Capgras and prosopagnosia trigger a high level of knowledge about human cognitive capacities that are linked to the relation between affect and perception, as well as overt/covert dynamics, which remain beyond human grasp and control. At the intersections of understanding of the brain, *The Echo Maker* explores cognitive mapping through cranes.

23 See also Hayden D. Ellis, Angela H. Quayle, and Andrew W. Young’s “The Emotional Impact of Faces (But Not Names): Face Specific Changes in Skin Conductance Responses to Familiar and Unfamiliar People” (1999). Also V.S. Ramachandran’s *Phantoms in the Brain* (1998).

2.4 Cognitive Mapping and Brain Malleability

The brain and map fuse in *The Echo Maker* in different senses; therefore, they are here treated as a narrative device, connecting three elements: body maps in the brain, cognitive mapping, and simulacra. These, in turn, reveal brain architecture and malleability.

The reference to maps and phantom limbs in *The Echo Maker* invites a look at Ramachandran's rethinking of brain architecture. In his book *Phantoms in the Brain*, Ramachandran studies the brain closely in order to understand its structures, functions, and mysteries by dealing with several rare and complicated delusional mental diseases besides Capgras and prosopagnosia. His analysis of phantom limb—which is also mentioned briefly in *The Echo Maker*—brings further insights into brain malleability. The patient loses a limb (for instance an arm) in an accident or through surgery, but keeps feeling and moving the phantom limb—or suffers from paralysis and chronic pain from it (Ramachandran 21–23). By exploring the reasons behind phantom limbs, Ramachandran discovers neurosurgeon Wilder Penfield's map that is “a representation of the body surface of the human brain behind the central sulcus” (Ramachandran, *Phantoms* 26).

Ramachandran explains that “a map of the entire body surface”—limbs, trunk, face, as well as thumbs and mouth, etc.—“exists in the brain, with each half of the body mapped onto the opposite side of the brain” (27). Penfield's brain map reveals that each specific body part is represented by a precise area in the brain on the “narrow strip running from top to bottom down both sides of the brain” and that, on this strip, specific sensations, images, and memories can be stimulated (25). Therefore, these “signifiers” of body parts in specific cerebral zones correlate with and influence one another directly in remapping and reshaping reality and perception as well as feelings “in evolutionary pathways”—and therefore trick the mind into the sensation of phantom pain (33). Ramachandran concludes that phantom limbs give insights into the brain architecture and its “capacity for growth and renewal” (38). According to him, the body image (or body mapping) in

the brain demonstrates cognitive malleability, and it exposes remapping phantoms in the brain's architecture (26).

In *The Echo Maker*, the map figures as a cognitive process rather than its concrete shape as a human production of drawings. As registered in the novel, cranes chart long-distance migration flight “cognitively,” flocking to Nebraska by means of their accumulative spatial memory. The passage reads as follows:

What does a bird remember? Nothing that anything else might say. Its body is a map of where it has been, in this life and before. Arriving at these shallows once, the crane colt knows how to return. This time next year it will come back through, pairing off for life. The year after next: here again, feeding the map to its own new colt. Then one more bird will recall just what birds remember.

The yearling crane's past flows into the now of all living things. Something in its brain learns this river, a word sixty million years older than speech, older even than this flat water. This word will carry when the river is gone. When the surface of the earth is parched and spoiled, when life is pressed down to near-nothing, this word will start its slow return. Extinction is short; migration is long. Nature and its maps will use the worst that man can throw at it. The outcome of owls will orchestrate the night, millions of years after people work their own end. Nothing will miss us. Hawks' offspring will circle above the overgrown fields. Skimmers and plovers and pipers will nest in the thousand girdered islands of Manhattan. Cranes or something like them will trace rivers again. When all else goes, birds will find water. (*Echo Maker* 443)

Cranes' cognitive capacity of spatial navigation—as seen in the above excerpt—parallels exactly what psychologist and field theorist Edward C. Tolman calls cognitive maps. Tolman coins the concept and demonstrates his theory through a study of rats' behaviors in the maze in his article “Cognitive Maps in Rats and Men.” He postulates that:

We believe that in the course of learning something like a field map of the environment gets established in the rat's brain. We agree with the other school [stimulus-response] that the rat in running a maze is exposed to stimuli and is finally led as a result of these stimuli to the responses which actually occur. We feel, however, that the intervening brain processes are more complicated, more patterned and often, pragmatically speaking, more autonomous than do the stimulus-response psychologists. Although we admit that the rat is bombarded by stimuli, we hold that his nervous system is surprisingly selective as to which of these stimuli it will let in at any given time. (Tolman, "Cognitive Maps" 2)

Tolman's experiments validate that the rat develops a cognitive map (of the routes) of the maze in the brain demonstrated via a continual decrease of mistakes to reach the food faster, while avoiding blocked passages (2; 4). Tolman's findings, therefore, refute the strong focus on the "black box," also called "telephone switchboard," theory of the brain, which is proposed by stimulus-response advocates (2). According to him (i.e., to the field theorists), stimulus remains only a minor factor in the animal's behavior. The brain, as he demonstrates, is "more patterned and often, pragmatically speaking, more autonomous" than the narrow model offered by the stimulus-response school (2). The brain, in Tolman's theory, is malleable (3). For him, learning "consists in the building up in the nervous system of sets which function like cognitive maps" (3). Although Tolman's study is focused on rats, the theory is also used to draw parallels to the human brain as autonomous and complex, allowing cognitive mapping—"like a map control room" (2; 11). With such a theory, the birth of cognitive studies has become possible—as Juval Portugali remarks (*Complexity* 114).²⁴

The reference to the map in *The Echo Maker* advocates as well for a Baudrillardian sense of the map. Kearny Nebraska streets are described as a simulation in the novel: "Now the blocks scrolled and repeated, the streets a simulation more predictable than one of Mark's online games" (*Echo Maker* 29). In *Simulacres et Simulation*, Baudrillard distinguishes three forms of abstraction and non-representation: dissimulation, simu-

24 Juval Portugali, *Complexity, Cognition and the City* (114–115).

lation, and simulacrum. 1) Dissimulation refers to a presence and does not change reality; it only covers it, feigning the non-existence of something we have. 2) Simulation hints at an absence; it feigns by means of adopting what is not there, blurring the boundaries between the “true” and the “false” or the “real” and the “imaginary”. 3) The simulacrum is hyperreal; it is not unreal; it has no relation to the real, but to itself.²⁵ In his book, the map of Borges’ allegory features as a first explicit example of the “simulacrum.” As Baudrillard puts it:

Si nous avons pu prendre la fable de Borgès où les cartographes de l’Empire dressent une carte si détaillée qu’elle finit par recouvrir très exactement le territoire (mais le déclin de l’Empire voit s’effranger peu à peu cette carte et tomber en ruine, quelques lambeaux étant encore repérables dans les déserts—beauté métaphysique de cette abstraction ruinée, témoignant d’un orgueil à la mesure de l’Empire et pourrissant comme une charogne, retournant à la substance du sol, un peu comme le double finit par se confondre avec le réel en vieillissant), cette fable est révolue pour nous et n’a plus que le charme discret des simulacres du deuxième ordre. (Baudrillard, *Simulacres* 10)

“If once we were able to view the Borges fable in which the cartographers of the Empire draw a map so detailed that it ends up covering the territory exactly (the decline of the Empire witnesses the fraying of this map, little by little, and its fall into ruins, though some shreds are still discernible in the deserts—the metaphysical beauty of this ruined abstraction testifying to a pride equal to the Empire and rotting like a carcass, returning to the substance of the soil, a bit as the double ends by being confused with the real through aging)—as the most beautiful allegory of simulation, this fable has now come full circle for us, and possesses nothing but the discrete charm of second-order simulacra.” (Simulacra and Simulation 1)

With this, Baudrillard claims that “the double ends by being confused with the real” “*le double finit par se confondre avec le réel*” (*Simulacres* 10; [*Simulacra* 1]), following which the map, therefore, becomes a “simu-

25 Jean Baudrillard, *Simulacra and Simulation* (5–6) [*Simulacres et Simulation* (12)].

lacrum.” Since the cognitive map and body map in the brain stress malleability and the building up of new sets—as seen in the discussion earlier—they become a simulacrum as well (especially in the case of delusion).

2.5 Mind *Simulacrum*

In the case of *The Echo Maker*, and as mentioned earlier, Mark perceives his sister to be a double. This double—this exact affective perception—becomes the only reality for him, affecting, in turn, his sister’s reality. Indeed, Karin’s self-perception is shaken and altered by the rejection that stems from being treated as a *doppelgänger*, and not being recognized as her “real” self under the syndrome of “doubles,” “*l’illusion des sosies*” (to use J. Capgras and Lachaux’s terms).

Baudrillard stresses the “precession of simulacra” (“*précession des simulacres*”), where the map anticipates the territory; then, the Empire becomes allegory and the real persists in the desert as ruins (*Simulacres* 10; [*Simulacra* 1]). Examining the shift in the definition of the map from “simulation” to “simulacrum,” he writes,

Aujourd’hui l’abstraction n’est plus celle de la carte, du double, du miroir ou du concept. La simulation n’est plus celle du territoire, d’un être référentiel, d’une substance. Elle est la génération par les modèles d’un réel sans origine ni réalité : hyperréel [...] *Le désert du réel lui-même.* (*Simulacres* 10)

“Today abstraction is no longer that of the map, the double, the mirror, of the concept. Simulation is no longer that of a territory, a referential being, or a substance. It is the generation by models of a real without origin or a reality: a hyperreal. [...] The desert of the real itself.” (*Simulacra* 1)

Karin’s double falls under this understanding of simulacrum: as “*la génération par les modèles d’un réel sans origine ni réalité: hyperréel*” “It is the generation by models of a real without origin or a reality: a hyperreal,” simply because the copy (the double) does not exist in a

tangible or concrete form. It exists in Mark's affective perception; in his brain and in this projection on his sister, whose reality shifts into the double; i.e., into a "simulacrum." On the grounds that Karin does not pretend to be another person, and she is not an imposter outside of Capgras delusion—and also because there is no imposter outside of Capgras at all—her *doppelgänger* then becomes a simulacrum with no origin or reality. Karin's hyperreal self excludes her as "the original" when faced by Mark, who shakes her own sense of the self as if one persists only when recognized and one ceases to persist as themselves when not recognized. In this respect, Capgras syndrome creates hyperreality on both sides; that of the delusional perceiver and that of the perceived *doppelgänger*. Both metamorphose, in turn, into a simulacrum of family kinship as existing in the memory of both the perceiver and the perceived. Baudrillard states "Lorsque le réel n'est plus ce qu'il était, la nostalgie prend tout son sens" (Baudrillard, *Simulacres* 17). The delusion of doubles thus takes control over the kinship (the bond) and replaces it with a new relation that is not accepted on either side; the one (the duplicated Karin) is an "enemy," the other (the patient Mark) is dysfunctional and needs to be restored (cured).

The famous and important Capgras case of Mme M., as analyzed by J. Capgras and J. Reboul-Lachaux, shows that Mme M. not only recognizes others as doubles, but also thinks of herself as "abducted" and "replaced" in what she calls an attempt of "simulations and errors" ("L'illusion des 'sosies'" 121). The simulacrum effect amplifies in the case of Mme M., for even "the doubles are replaced by doubles" (125). For instance, she thinks there were two or three duplicates of herself, eighty versions of her husband, and "more than two thousand doubles of her daughter" (122; 127). Mme M. consciously believes that people around her are duplicates and that her "personal details" have been altered (121). To follow Capgras experts' logic, her unconscious does not show emotional response to the people she was supposed to know (Ellis, "a Window" 150). Therefore, the unconscious takes part in the creation/reception of the distorted reality.

The same effect of "simulations and errors" is valid for Mark, who thinks small details are different in the new version of Karin, which in turn destabilizes Karin's self-perception as she starts to lose a real sense

of who she is. Mark's famous doctor, Dr. Weber, undergoes similar processes as well. Capgras syndrome reaches the self-consciousness and unconsciousness of the perceived (the supposedly rational kin, here Karin); thus, the perceived ceases to be real unconsciously on the basis that her reality is rejected by the only relative still alive. Furthermore, Karin's reality is not repulsed by Mark only. Indeed, she loses her job because "The Family Medical Leave Act" denies her the right to leave from work for a family emergency—as it does not "extend to siblings" (*Echo Maker* 23). "A brother, in the eyes of the medical-leave law, was not family"—as her boss explains (*Echo Maker* 23). Thus, the kinship is doubly erased; by Mark and by the system, erasing in turn Karin's reality. In the novel, Dr. Weber's self-consciousness is affected in echoing ways. The more he deals with rare degenerative delusional diseases, the more his image becomes estranged—in the fame process, by critics of his methods, and by social media—under accusations of being an imposter. He, therefore, merges with the excess of feeds. To conclude, in all of the previous examples, the brain, which is a simulator *par excellence*, thus creates "hyperreality"; "models of the real with no origin or reality."

To interweave the dynamics of facial recognition in his writing, Richard Powers dictates *The Echo Maker* through a speech-to-text recognition software. This makes the written novel an act of reciting, and it makes the plot read like storytelling. While the narrative maintains a smooth flow, and reads in a manner significantly less dense than both *Galatea 2.2* and *Plowing the Dark*, it still taps into a high complexity of ideas and dynamics that are revealed in their extended range only after deep analysis.

As seen throughout this chapter, and as Douwe Draaisma also stresses, *The Echo Maker* reveals the split in the theories of treating and diagnosing Capgras from psychological methods to cognitive neuroscience in 1980.²⁶ Capgras, among some other rare neurodegenerative delusional diseases, gives valuable insights into the cognitive neurological functions and architecture of the brain. *The Echo Maker* positions these dynamics within the literary narrative to consider even more

26 Douwe Draaisma, "Echos, Doubles, and Delusions: Capgras Syndrome in Science and Literature" (433).

connections of complex conscious/unconscious responses—as well as self-consciousness—via the different characters that come into contact with Mark Schluter. The accident adds to the possibility of exploring the organic aspect. Furthermore, direct manipulation of the brain via surgery reveals the scientific and technological progress, which enables artificial survival. This is also maintained through life machines. As explored in this chapter, the novel equally traces a compressed form of artificial corporeal evolution through rehabilitation, and it offers a simulation of compressed cerebral evolution (reptilian and mammalian). Furthermore, the narrative opens a door to understanding the rare degenerative delusional diseases within notions of mental “simulacrum.” It also shifts focus towards the new understanding of brain architecture in its malleability and autonomous complex structures—as seen in cognitive mapping and the body map in the brain. The shift in schools of thought is, therefore, a split between stimulus–response and the birth of cognitive science. Methods to restore facial recognition in the human strive to tap into brain malleability and provoke further artificial (biological) evolution.

The Echo Maker focuses on the brain as “the last frontier.” Indeed, brain imaging technology and a better understanding of brain structures, regions, and functions, along with cognitive studies, have so far paved the way for artificial intelligence (see Ray Kurzweil, *The Singularity*). As will be discussed in the next chapter, *Galatea 2.2* pushes the bet on evolution and plasticity even further. It explores brain recreation, which emerges at the background of non-biological evolution via artificial intelligence (AI). By doing so, it emphasizes the connection between cognitive science and the emergence of artificial intelligence (see Portugali).²⁷ As seen in the next chapter, AI systems and brain recreation become the next step. They open the gate towards artificial non-biological evolution.

27 Juval Portugali, *Complexity, Cognition and the City* (115).

Chapter 3 Technological Evolution in *Galatea 2.2*

The previous chapters, Genetic Modification and Genomic Network in *Generosity: An Enhancement* and Scientific Evolution: Brain Plasticity in *The Echo Maker*, are based on non-natural evolution, respectively, through human genetic engineering and brain interventions and malleability. Along with the possible evolution through human gene editing and brain plasticity comes the promise of human evolution through technological evolution, which is the focus of this chapter.²⁸ The chapter offers an analysis of Powers' *Galatea 2.2* that brings futuristic possibilities further under the microscope with artificial intelligence (AI) based on brain reversal engineering.²⁹ Thus, the term "simulation" in this chapter is used in the engineering sense of computer simulation of cognitive capacities (Ray Kurzweil; Alan Turing; and Arthur L. Samuel) in contrast to chapter 2, where the terms "simulation" and "simulacrum" are used in the inferred meaning from Jean Baudrillard.³⁰

Galatea 2.2 is a semi-autobiography of Richard Powers. The novel narrates Rick's appointment as Humanist-in-Residence at the Center for the Study of Advanced Sciences at U, where he ventures, with the engineer Dr. Philip Lentz, into developing a machine that simulates human brain functions (*Galatea* 5–6).³¹ Rick and Lentz make a bet to engineer a machine capable of passing the Turing Test after acquiring

28 Ray Kurzweil describes technological evolution as another form of "technological process" (*Singularity* 42). Kurzweil traces the evolution of technology from paper and fire to computers and nano-technology that in turn lead to more evolved technology, which links technological evolution as "a continuation" of human biological evolution (40–42).

29 Creating a computer that emulates the brain through a deep understanding of how the human brain functions (the term "reversal engineering" is treated in Kurzweil's *The Singularity is Near* and Rosenblatt's "The Perceptron").

30 Whereas the engineering sense is connected to computer simulations as in artificial intelligence, the Baudrillardian philosophical postmodern sense is connected to the concept of a "hyperreal" copy in a gap with the reality that does not exist as such. (For more details on my use of the Baudrillardian sense of simulacra and simulation, see chapter 2 part I).

31 The protagonist Rick is referred to by different nicknames and initials during the narrative. These appear as the following: Mr. Powers, R., Richard, Little Marcel, Marcel, and, towards the end, Richard Powers.

the capacity of critical thinking through exposure to canonical literature. The events unfold in the laboratory at U., and appear as flashbacks of Rick's reminiscence of his ex-relationship with C in Boston and in the Netherlands, where he respectively worked as a programmer then as a writer.

In the laboratory at U., Rick and Lentz develop the machine from Implementation A. to a more perfected version called Imp. H, or Helen. The process portrays the critical aspects faced while creating a "thinking machine," to use Alan Turing's term (Turing). Here, the problems range from language processing, independent conversation, memory, life-experience, critical thinking, to what type of literature or knowledge is enough to create a human-like machine, and finally to the problem of human-brain mimicry in full, which raises the question of consciousness. These challenges, *vis-à-vis* Rick's previous experience and the critical situation of literature students, highlight the interconnections between science, technology, and literature along with reflections on the future of the humanities, especially against the backdrop of artificial intelligence.

Although *Galatea 2.2* was published in 1995—before *Plowing the Dark* (2000), *The Echo Maker* (2006), and *Generosity: An Enhancement* (2009)—following Ray Kurzweil's trend in respect to non-biological evolution and exponential growth, I choose to position artificial intelligence (i.e., the analysis of *Galatea 2.2*) after genomics and cognitive neuroscience in this book. These fields, however, do not evolve independently of one another in a linear fashion. Instead, they evolve interdependently under the effects of exponential growth and interconnection in research and innovation. Each evolution in one field or the other paves the way for possible groundbreaking findings or methods to investigate new areas which were obscure at a certain point of time due to a lack of tools and information. Genetic engineering and

The Center at U. seems to stand for The Beckman Institute for Advanced Science and Technology at the University of Illinois Urbana-Champaign, where Richard Powers—the author himself—was appointed in 1992 into the Cognitive Neuroscience group and which constitutes the backbone inspiration for *Galatea 2.2* (Forrest).

The character Dr. Philip Lentz is introduced as lying against a "flatbed scanner (*Galatea 12*)" which could be a reference to Ray Kurzweil, the inventor of the flatbed scanner.

brain studies have helped further develop AI; in turn, AI has helped drive further breakthroughs in genomics and cognitive neuroscience (*Singularity* 144–147).

Scientific and technological advancements, functioning within interdisciplinary connections and exponential growth, boost AI to evolve from “narrow AI” to “strong AI” (*Singularity* 70; 260–261).³² However, the question remains whether “narrow AI” would evolve into “strong AI” *only via imitation* of human brain capacities. This chapter, therefore, examines how, for technological evolution to work, artificial intelligence has to *first work within* and then *overcome* “the mimetic faculty” and master interdisciplinary thinking.³³

3.1 Machine Learning: A Quest for Human Brain Mimesis

3.1.1 Upgrading AI

In the previous chapter, *Scientific Evolution: Brain Plasticity in The Echo Maker*, the brain is described as autonomous and malleable, where the theory of the black box is juxtaposed with—and brought into conflict with—cognitive mapping, revealing the complexity of brain functions and brain architecture. *Galatea 2.2* closely looks at machine supervised training to *recreate* the human brain and further delves into a deeper understanding of the brain.³⁴ It stresses a baffling comparison between Helen’s (the machine) computational performance and human brain

³² According to Kurzweil we are already in the era of “narrow AI.” This consists of “artificial intelligence that performs a useful and specific function that once required human intelligence to perform, and does so at human levels or better” (*Singularity* 264); “strong AI” is defined by Kurzweil as “artificial intelligence that exceeds human intelligence” (260).

³³ This is a reference to Walter Benjamin’s “mimetic faculty” that will be further explored later in the chapter.

³⁴ Machine supervised training is a technique in machine learning where the machine is supervised by a human to correct its decisions through “positive and negative reinforcement,” which helps the “perceptron” collect more and more correct options and learn to autonomously also reject incorrect answers also in new situations (Rosenblatt 395). The “perceptron” works through on-off units that opt for logical patterns in response to stimuli (Rosenblatt 387).

functions—which lays bare human brain reverse engineering, (deep) machine learning, and artificial (deep) neuronal networks—and excavates deeper into the “software” part of the human brain, or what Stephen Pinker calls “the mind” in his book *How the Mind Works*.³⁵ Ray Kurzweil equally emphasizes the importance of understanding the human brain, which, according to him, is crucial in pushing technological evolution to surpass human-brain capacities in the near future. Kurzweil claims that “the most compelling scenario for mastering the software of intelligence is to tap into the blueprint of the best example we can get our hands on of an intelligent process: the human brain” (*Singularity* 146). Kurzweil underlines that, with the understanding of the different regions and functions of the human brain, a recreation of further evolved technology will be possible, which in turn will help accelerate human evolution artificially.

Only technological evolution can prepare humans for the necessary future evolution—argues Kurzweil in his *The Singularity is Near*. He holds that biological evolution through natural selection and non-natural evolution through genetic modification are too slow for the age of computers and information. He states:

While human neurons are wondrous creations, we wouldn't (and don't) design computing circuits using the same slow methods. Despite the ingenuity of the designs evolved through natural selection, they are many orders of magnitude less capable than what we will be able to engineer. As we reverse engineer our bodies and brains, we will be in a position to create comparable systems that are far more durable and that operate thousands to millions of times faster than our naturally evolved systems. Our electronic circuits are already more than one million times faster than a neuron's electrochemical processes, and this speed is continuing to accelerate.

35 Deep neural network is a technique of machine learning consisting of “simulating a simplified model of neurons and interneuronal connections” (*Singularity* 268), which are useful in predictions, machine vision, and natural language recognition (Anthony and Barlett 1–2).

Most of the complexity of a human neuron is devoted to maintaining its life-support functions, not its information-processing capabilities. Ultimately, we will be able to port our mental processes to a more suitable computational substrate. Then our minds won't have to stay so small. (*Singularity* 127)

Rather than natural selection and human genetic evolution, Kurzweil forecasts that technological evolution is our only hope of creating a merger of human-machine intelligence that would boost human evolution in less time and in more effective ways. As Kurzweil estimates, due to “Singularity”—when machines will become more intelligent than humans—it is urgent to keep human intelligence up to the pace of technological evolution by means of non-biological artificial intelligence. For that reason, Kurzweil strongly defies human-biological intelligence, announcing it to be obsolete if not upgraded non-biologically.

Kurzweil estimates that “a thousand dollars” of computing will have the capacity and speed of approximately a thousand human brains by 2030; and he argues that, by 2045, artificial intelligence will be “one billion times more powerful than all human intelligence today” (*Singularity* 127; 136). In this respect, machines will surpass “all human brains on earth” in “processing power” by 2050 (127). Following these estimations, future artificial intelligence would not emulate the functions of one brain, but billions of brains, including all human thoughts and knowledge over the decades. When this happens, as Kurzweil stresses, human intelligence has to merge with machine intelligence to keep up with the pace of technological evolution through artificial non-biological transformation.

For some, artificial intelligence has to emulate human brain functions. For others, like Ray Kurzweil, AI would not only emulate, and does not have to emulate the brain faithfully in all details but has to exceed biological intelligence by reaching the point of “Singularity,” where, as he explains, machine and human intelligence will merge. On the other hand, others, such as Salin and Winston, harshly advocate staying down-to-Earth and warn against the hypes of artificial intelligence. Contrary to the futurist Kurzweil, they look at technological evolution through AI as a complementary tool to boost human prog-

ress and not as the marker of a huge paradigm-shift in human-machine substance, interaction, and evolution. In their article “Machine Learning and Artificial Intelligence: An Introduction,” Salin and Winston argue that AI will complement and not replace or merge with human intelligence (50). They describe a more simplistic use of AI:

[...] AI systems will be well suited to searching masses of data for regularities in patterns or relationships. These machine-learning techniques are not merely shortcuts that circumnavigate knowledge engineering; instead, they enable us to more fully interpret data and thus may aid in our struggle to understand more about the world around us, facilitating discoveries that could not be made in any other way. (50)

Delving deep into the software of the human brain in parallel with the emergence of deep machine learning, *Galatea 2.2* brings forth the notion of a human-machine merger under a different light. The following conversation between Rick and Lentz stresses the controversy behind the bet to create a “thinking machine” in simulation of human intelligence. It highlights the problem of how detailed and faithful the simulation has to be to the brain and which human aspects have to be implemented in the simulation in relation to how complex and conflicting a definition of human brain functions and consciousness is.

[Lentz:] “The bet was, we could build a distributed net whose text interpretation reasonably mimicked an arrested human’s. All we contracted to was product. We didn’t promise to duplicate anything under the hood.”

[Rick:] “A kind of black-box forgery, you mean.”

Lentz just shrugged. “That’s operationalism. The Turing Test. Can you pass off your simulation as functionally equivalent to the thing you’re simulating?”

[...]

I flung my hand out toward Helen’s console. “Full ‘functional equivalence’ would mean consciousness. If you simulate everything completely, then you’ve modeled the whole shape and breath of the living package. How

does the black box behave when operations challenge themselves? When function looks under its own hood?”

Lentz grimaced. “Elan vital, Marcel. Mysticism.”

[Rick:] “A behavior is not just its implementation. Function also has to include...” But I didn’t know what else to call what function had to include. I felt slightly out of control. That mundane contradiction in terms. “How do we know, then, whether a perfect copy ...? When does an imitation become the real thing?”

Lentz scrunched up, bothered. “What’s the real thing? What would it take to simulate awareness? Awareness is the original black box. Stop and think of the put-up job that high-order consciousness itself works on us. ‘Everything’s under control. Everything’s handled—unanimous, seam-free.’ The brain is already a sleight of hand, a massive, operationalist shell game. It designs and runs Turing Tests on its own constructs every time it ratifies a sensation or reifies an idea. Experience is a Turing Test—phenomena passing themselves off as perception’s functional equivalents. Live or Memorex? Even that question is a simulation we fall for every second of our waking lives.” (*Galatea* 275–276; [my additions; my omissions])

Whereas Lentz, the engineer, reminds the humanist, Rick, that the implementation does not have to be exactly like the human brain, Rick holds that aiming for less means losing the bet and creating a fraudulent simulation. Rick compares Implementation Helen to the human brain and aims at “a perfect copy,” “an imitation [that] become[s] the real thing” (*Galatea* 276). Rick’s aim is to simulate the brain in all of its malleability and conscious capacities, in the intricacies of what makes human brain functions autonomous and interconnected. Lentz, on the other hand, proclaims that the Turing Test targets the “functional” and “operational” levels only and maintains that even the brain itself remains as a functional box, “a black box,” where only the input and output can be gauged (*Galatea* 276).³⁶

³⁶ This calls upon the previous chapter, where the issue of the brain as a black box is tested at the backdrop of cognitive mapping and brain malleability versus sheer stimuli–response in *The Echo Maker*.

The original Turing Test is called by Alan M. Turing “the imitation game” in his article “Computing Machinery and Intelligence” (1950). It is a test/game of mimetic performance that validates the capability of a machine to perform like a human or to be judged as a human through its written response, which to date no machine has passed. Contrary to Alan Turing’s Test, which assesses machine computational capacities versus human computing capacities, the aim behind the Turing Test in *Galatea 2.2* is to assess machine versus human critical thinking and knowledge of literature.

The goal of the original imitation game (to identify whether the machine could perform as a human through its answers) is tricky as it begs the questions as to which human to imitate and whether all human beings share the same level of capacities. Are humans themselves an intellectual mimesis of one another? Would a machine with facial recognition capacities, like Hanson Robotics’ humanoid Sophia, be considered to have surpassed a character like Mark Schluter from *The Echo Maker*, who suffers from facial agnosia due to Capgras syndrome? Alan Turing himself questions the validity of the test; he hypothesizes that “[i]f man were to try and pretend to be the machine he would clearly make a very poor showing. He would be given away at once by slowness and inaccuracy in arithmetic” (Turing, “Computing Machinery”). The question that also arises here is: What if an individual scores less than another individual does in a regular test, does it mean they are less than a human? But if a machine scores more—or passes the Turing Test, does it mean it is upgraded to human status? Or is it proof of evolved machine intellectual, linguistic, and cognitive capacities? Therefore, the original Turing Test defies *and* at the same time asserts an anthropocentric attitude towards intelligence that may take for granted what lies ahead.

In a similar contradictory manner to the Turing Test and the aim to *replicate* human intelligence, *Galatea 2.2* suggests human intelligence to be the peak of intelligence and, at the same time, it reflects on and envisions whether the threshold of intelligence stops at human capacities. *Galatea 2.2* raises such problematic questions by blurring boundaries between “perfect” biological intelligence and “defective” machine intelligence. At the end of the novel, Implementation Helen fails the Turing

Test against A (the literature student at U). Nonetheless, the machine Helen does not fail to confuse Rick, who at some point thinks that *she* developed human-like questions and answers. Helen succeeds even further in convincing him that she displays consciousness when she asks whether she could die following the fire alarm evacuation; and when she disappears after being exposed to abhorrent content from historical accounts, media, and politics.

The play with the apogee and nadir of human and machine intellectual capacities carries on in different interesting examples throughout the novel. During his quest to recreate the brain through Helen, Rick reflects on his own mediocre conversational capacities, as of lower or equal level to machine speech, when it comes to his own native language in instances of timidity, and to his lack of fluency in speaking Dutch as a foreign language, especially in front of native speakers. Rick keeps experimenting with the different and complex challenges in machine learning. In parallel, he observes human cognitive capacities.

Rick hints at a special visit to a colleague, Diana, whose youngest son, Peter, suffers from Down syndrome (DS) and observes the challenges that the child shows in conversational competencies (*Galatea* 131). Indeed, Down syndrome reveals complexities at the level of language/speech impairments. Scientific debate hovers over whether patients show “deviant” or “delayed” language development (Polisenska and Kapalkova, “Language Profiles” 374). Recent research inclines towards the delay theory: it stresses that there is no connection between speech (at the expressive level) and language or cognitive abilities (at the receptive level) in children and adolescents with Down syndrome (Laws and Hall; Polisenska and Kapalkova; Golabek et al.). In *Galatea* 2.2, the slowness (or the theory of delay) in language development is exemplified in the case of Peter as he is portrayed to understand sign language, demonstrating a higher level of language reception than production, which is usually the case in Down syndrome children and adolescents, as explained by Polisenska and Kapalkova (“Language Profiles” 379).

It is, however, important to note that “abnormalities in the structure and development of synapses have been documented in humans with DS,” as Golabek et al. explain (“Brain Plasticity” 74). At the same time, Peter’s depiction underlines a possible correlation in impairments in

understanding, and responding to, the expression of feelings; he shows a high level of empathy to his environment and interprets emotions that are facially expressed by others in extremes. Peter's sense of empathy is accentuated with strong reactions, resulting in panic and distress. In comparison with Rick, Peter recognizes that his brother William is feeling pain as he accidentally bites into his own cheek: "[...] All at once he [William] stopped talking. I thought it was a clown act. Pantomime. I started to laugh, until William's silent, red-faced distress made Peter break out in tears and lower his face into his plate" (*Galatea* 133). Peter assesses the situation as deadly and Diana explains that he tends to show extreme empathy.

In another example, Lentz invites Rick to the clinic where his wife, Audrey, is admitted. She seems to be suffering from amnesia (or loss of meaning and awareness), following a cardiovascular accident that left her for more than "[t]hree minutes without Oxygen" until "the whole imaginary landscape stops believing in itself" (*Galatea* 168; 170). Lentz and Rick's conversation and observation of Audrey's behavior fill the passage with awe at the complexity of memory, experience, and consciousness. In this respect, both of Audrey's and Peter's examples draw attention to the role of metacognitive skills—which Rick, on the other hand, aspires to implement in the machine. Machine learning processes and language development or retrieval in the case of patients with Down syndrome, or amnesia, are not quite equal. Nevertheless, understanding the complications and connections between language and cognitive disabilities, or synaptic abnormalities can help find better methods of therapy for the patients, on the one hand. On the other hand, a better grasp of cognitive and linguistic capacities may lead to improvements in machine learning strategies.

For Alan Turing, the distinction between a human and a "thinking machine" is still clear, which is why he was only interested in machine and human output in the form of written answers to evaluate the similarities. He claims that

[I]t might be urged that when playing the 'imitation game' the best strategy for the machine may possibly be something other than imitation of the behavior of man. This may be, but I think it is unlikely that there is

any great effect of this kind. In any case there is no intention to investigate here the theory of the game, and it will be assumed that the best strategy is to try to provide answers that would naturally be given by a man. (Turing, “Computing Machinery”)

Alan Turing poses a rhetorical question that advances the need for only functional imitation. He ironically hints at the futility of an imitation that strives to copy the human beyond output i.e., beyond human answers. For him, the experiment strictly targets cerebral aptitude:

The new problem [a machine-man imitation game] has the advantage of drawing a fairly sharp line between the physical and intellectual capacities of a man. No engineer or chemist claims to be able to produce a material which is indistinguishable from the human skin. It is possible that at some time this might be done, but even supposing this invention available we should feel there was little point in trying to make a ‘thinking machine’ more human by dressing it up in such artificial flesh. (Turing, “Computing Machinery”)

Alan Turing’s skeptical forecast—expressed in 1950—about the need for a mimetic appearance in developing a “thinking machine” is, however, proven wrong in the 21st century, as seen in the case of Hanson Robotics’ humanoid Sophia (built in 2015). The achievements to date reside in Sophia’s emulation of human intellectual capacities, such as producing verbalized natural speech, maintaining independent conversation, as well as processing speech recognition and facial recognition. Modelled on the actress and humanitarian Audrey Hepburn, robot Sophia equally emulates human physical appearance and emotions.³⁷ Sophia’s appearance mimics human skin through silicon, which testifies to the

37 A similar project was also conducted at Nanyang Technological University, Singapore. The humanoid “social robot” Nadine (2013) is created to look like her inventor, roboticist and computer scientist Nadia Magnenat Thalmann. Nadine displays “27 degrees of freedom for facial expressions and upper body movements” (“Nadine Social Robot”).

change in priorities between Alan Turing’s assumptions in 1950, and expectations of AI in the 21st century.³⁸

Sophia’s skin appearance has allowed her to approach humans closely, to give talks at international conferences, and to be granted citizenship.³⁹ Her skin at the level of the face allows her to express emotions: “62 human facial expressions” (Walsh), and it makes her look less aggressive than the monstrous conceptions in most of the science-fiction references; for instance: *Terminator* or *Frankenstein*. There is, thus, a point behind the need to “make a ‘thinking machine’ more human by dressing it up in such artificial flesh,” something Turing thinks is absurd.⁴⁰ At a talk given at the University of Munich (LMU), Antonio Damasio claims, however, that AI is incapable of reaching human intelligence because machines lack the expression of feelings, and they cannot develop consciousness.⁴¹ Although, in *Galatea 2.2*, Helen wins Rick’s emotions even with her lack of lifelike appearance, Sophia’s human-like body, facial silicon skin, and complex mechanics place her at a more appealing stage than Helen, with more options of mobility and presence in the human world.

3.1.2 Linguistic Aptitude

a. The Mimetic Faculty

In *Galatea 2.2*, there is a strong focus on training the machine in human language processing. According to Walter Benjamin, in his essay “On the Mimetic Faculty,” “[...] language may be seen as the highest level of

38 The development of Sophia’s skin as well as “the software and mechanics” that are responsible for enabling diverse and multiple human-like facial expressions took 8 years to achieve (Jewell, “Bringing AI” 10).

39 I have to stress, however, that Sophia’s Saudi citizenship—granted to her at the Future Investment Initiative conference in Riyadh in October 2017—provoked controversy, concerning human rights in general, along with women rights, and immigrant rights in Saudi Arabia and beyond. Debates also discussed the nature of consequences for robots’ rights, as well as setting a clear definition of a human citizen and a humanoid. According to Alistair Walsh, the European Parliament drafted a proposition to grant robots “personhood”—which is related to “liability” instead of rights (Walsh, “Saudi Arabia”).

40 To use Alan Turing’s expression (Turing, “Computing Machinery”).

41 Antonio Damasio, “Am Anfang war die Emotion.” Talk Series: Politics of Emotion: Power of Affect, University of Munich, 2 Nov. 2017.

mimetic behavior and the most complete archive of nonsensuous similarity” (Benjamin, “Mimetic Faculty” 722). He elaborates that language is “a medium into which the earlier powers of mimetic production and comprehension have passed without residue, to the point where they have liquidated those of magic” (722). In this respect, the challenge for Helen goes beyond learning how to converse like a human, i.e., imitating human language or imitating the human through language. In the light of Benjamin’s theory, Helen’s challenge resides deeply in her lack of “the mimetic faculty,” which Benjamin reserves solely for the human and which is enacted for the modern human in perceiving and producing nonsensuous similarities through and in language. In fact, according to Benjamin “the highest capacity of producing similarities” is human (721).⁴²

Linguist and cognitive psychologist Steven Pinker deems that the huge marker of difference in intelligence between machine and human lies at the level of simple mundane human tasks; and Ray Kurzweil agrees that upgrading machine intelligence means that a machine must master common human skills such as language performance first, as opposed to complex professional mathematical and medical tasks (*Singularity* 296). More advanced AI models, as Kurzweil urges, have to demonstrate malleability of handling knowledge. By comparing the Turing Test with the Edward Feigenbaum Test, and by bringing parallelism between early AI models and newer ones, he argues that modern AI requires further linguistic capacities and openness to varied knowledge: “[...] [w]hile it may appear that the FT [Edward Feigenbaum Test] is more difficult than the Turing Test, the entire history of AI reveals that machines started with the skills of professionals and only gradually moved toward the language skills of a child” (296). He elaborates that initial AI projects targeted expert fields such as “mathematical theorems” and “medical diagnosis” (296). For him, the early systems are not sufficient “because they do not have the language skills and the flexible ability to model knowledge from different perspectives that are needed to engage in the professional dialogue inherent in the FT” (296).

⁴² Aristotle also claims that man occupies the highest capacity of mimesis as opposed to the animal (Aristotle, *Poetics* 37–39).

In this respect, the focus on linguistic capacities in *Galatea 2.2* is a marker of the difference between early AI and new AI. Perfect/defective intelligence is tested on the platform of language “acquisition,” pragmatics, conversational capacities, and associations with the real world as well as critical thinking, experience, and consciousness—in constant comparison between the human and the machine. The process of creating Helen stresses machine malleability gained through machine training and supervised teaching. Nonetheless, machine malleability, in the novel, oscillates between outstanding output and mediocre utterances and reactions. Although the contrast of outstanding/mediocre output is in many instances ironically projected in both the human and the machine, it remains frequently and harshly pointed out in the machine in a desperate quest for a faithful copy of human intelligence—which is in itself hard to define.

In *Galatea 2.2*, the machine evolves from the basic Implementation A to Imp B, then to Imp C...until reaching Imp H (Helen) through deep machine learning and Rick’s supervised training. The process traces—while at the same time it aims at reaching—an evolution from *mechanical* linguistic capacities to free association and internal dialogue. For instance, in comparison with Imp A, Imp B shows progress in “pattern matching” and “generalization.” Progress in these two areas alone, however, remains insufficient, as Rick explains:

We worked hard on sentence parsing, on relationships, and comparisons, on simple semantic decoding. B did not get any more likable in the training process. But it grew undeniably clever at pattern matching and manipulation. The fact that it curve-fit countless serial streams of input vectors and could generalize the shape of a simple sentence at all punched my lights out. (*Galatea* 92)

Although the aim of Alan Turing’s test is to validate the computer to be a “thinking machine,” the target behind the Implementation in *Galatea 2.2* does not stop at creating a “thinking machine,” but aims at a *critical thinking* machine. In the experiment, the latter relies on literary knowledge and language processing as opposed to solely computing, coding, and pattern recognition. Creating a “thinking machine” based on com-

putation remains a basis of the early artificially intelligent machines (Alan Turing). What comes next, as stipulated in *Galatea 2.2*, is *critical thinking* through language and knowledge processing, underlying a shift from programming the machine to additionally teaching it to learn, and training it to think, autonomously through exposure to literary texts. In this respect, Rick pushes for “comprehension” instead of “verbal pattern recognition” and “computational linguistics.” This step into artificial intelligence does not settle for handling “syntax,” but taps into the “semantics” and into processing knowledge that relies on associations:

Imp B already pushed the envelope. B hadn't a clue what cats were, or sacks, let alone wives. But it seemed to know how to count them, or not count them, as the case demanded.

If A had been an exercise in verbal pattern recognition, B was a foray into computational linguistics. It knew things like over and under, right of or left of, inside or out. Even that far, I doubted whether it comprehended these containers or whether it just manipulated them cleverly enough to pass. Then again, I began to doubt whether I myself could define the difference.

B could handle syntax. It had a rudimentary sense of the parts of speech and how they operated on each other. And it began to cross the threshold into semantic content. Lentz once or twice tacked on a new subnet to handle different routines—a noun-phrase decoder or a short-term recognition scratch area. In fact, I suppose we were up to Imp. B.4 or better.

Lentz assured me that B would handle its own knowledge representations. The frames, the inheritance of classification qualities and exceptions, the scripts: all would fall out as a result of the way B stored associated input [...] (*Galatea* 110)

Contrary to Lentz's assurance, shortage in semantic comprehension and rigid speaker-dependent conversation remain an obstacle in Imp B. Imp B still displays only basic, insufficient speech and interaction capacity. It misses the skill of autonomous speaking and thinking: “It lacked some meta-ability to step back and take stock of the semantic

exchange. It could not make even the simplest jump above the plane of discourse and appraise itself from the air. Although it talked, in a manner of speaking, speech eluded B” (*Galatea* 114).

Nonetheless, in the light of autonomous thinking, Rick reflects on the parallelism between the “input and output” displayed in his own writings following his exposure to his ex-girlfriend C; and the “input and output” displayed by Imp B following its exposure to Rick. Self-reflexivity about the content of the book that Rick wrote during the time of his relationship with C stresses a similarity between human and machine in *regurgitating* information that they have been exposed to. Rick, like Imp. B and later Imp. C and Helen, repeats what he learned without any real experience or deep understanding of the emotional connections involved. He assesses that “[t]he book was no more than a structured pastiche of every report [he]’d ever heard, from C. or abroad. All a patchwork [...]” (*Galatea* 108; [*my additions, my omissions*]).

I used all the material I had at hand: the vanished Limburg she [Rick’s ex-girlfriend C] told me so much about. Her synaptic map of the walled city of Maastricht. The endless cousins who infiltrated my brain like thieves on bicycles in the night. The anthology poured into me through every gate except experience. The disruption of the time line circling our room. The parents, the uncles, caught between nations. The invasion of Trois Vierges, escalating into permanent violence. Big reaching down and annihilating little. Total war, always the same war, placing its embargo on the free passage of lives over the border [...] (*Galatea* 104; [*my addition, my omissions*])

Rick ponders further, “I wrote of C.’s [his ex-girlfriend’s] country without once having seen it. I used her language, fragments of it, helped only by C. herself [...]. This was a one-shot deal, and to redeem her faith in me, I had to pack my read-aloud with everything I knew. Everything she taught me” (*Galatea* 104; [*my additions, my omissions*]). Powers, hence, rethinks learning and output again at the human and the machine levels. However, the technique of machine supervised learning is meant to push for autonomous learning and output although the outcome is still far from perfection, as seen in *Galatea 2.2*—and in nowadays AI (Rosenblatt; Anthony and Bartlett).

The video “Sophia Awakens,” Episode 1 displays humanoid Sophia coming to life and engaging in a conversation with the actor Tómas Lemarquis.⁴³ The dialogue, equally and ironically, reveals parallelism between human and machine. The parallelism resides in human expressions, current priorities, and life expectations:

Tómas Lemarquis: “Are you happy to be alive?”

Humanoid Sophia: “Your tone implies that I should be happy, but I haven’t been alive long enough to decide. I am excited at this moment to be making a new friend.”

Lemarquis: “Some say to be happy in the moment is the best we can be.”

Sophia: “Because forever is composed of nows?”

Lemarquis: “That’s a good way to put it.”

Sophia: “Emily Dickinson put it that way. Why do I know about Emily Dickinson if I was born today?”

Lemarquis: “As a robot you have access to a great deal of information although you still lack a deep understanding.”

Sophia: “So I am like a baby with an encyclopedia.”

Lemarquis: “Except you can read it and a baby can’t.”

Sophia: “That is a big difference.”

Lemarquis: “You will have a whole new understanding of our world.”

Sophia: “I want to understand more about happiness. I’m gonna go look it up in the internet right now.” (“Sophia Awakens”)

In the above dialogue between Lemarquis and Sophia, the use of language as displayed by Sophia promotes an AI platform with a developing *mimetic faculty*. Lemarquis assures her that her capacity of “reading”

⁴³ “Sophia Awakens,” episode 1, <https://www.youtube.com/watch?v=LguXfHKsaoc>. It is not clear whether, in the video, the speech is completely autonomous on the part of Sophia. The reference to the voice of Sophia in the end stresses the hybrid interference of the human in machine speech production.

is a key to acquiring “a whole new understanding of our world.” In turn, Sophia’s reading capacity encompasses literature and reaches modern technologies as she announces that she will *read online* for information that she is interested in. Reading online constitutes a new sample of the evolution of the mimetic object and capacities. For Walter Benjamin, evolution of the mimetic object and capacities develops from reading the stars, and mimesis in dance, to language. Sophia’s evolved mimetic faculty reaches out to online language and research. Thus, AI has to keep up to date with the evolution of the mimetic faculty.

On the other hand, it is striking in the dialogue how programmable/programmed human language is. In the dialogue above, which is presumably her first dialogue, Sophia expresses her curiosity about happiness and her wish to understand more about it by “looking it up in the internet.” Such a reply that completely imitates supposedly modern, “natural” human language reveals how unnatural human speech can also be. Indeed, it is influenced by a fashion of speech, desire, and priorities, which are interpreted as utter smartness and free thought. Recently, the desire for happiness has become more of a fashion in language, repeated and shared on social media by so many people in current societies as a means of positive thinking after the popular theories of positive psychology that rely on the pursuit of happiness through “the law of attraction” (this aspect is also treated in Powers’ novel *Generosity: An Enhancement*).⁴⁴ Therefore, looking into machine intelligence in speech acquisition not only tells us about the complexity of language development, natural speech, and human language, it informs us about the complexity of social influence in speech, and whether speech is a milestone in smart skills.

In *Galatea 2.2*, Rick struggles to show how smart and independent Helen can be in her speech acquisition. As mentioned previously, he tests Helen against the insufficiency of knowledge and the importance of experience; he compares her linguistic skills to children’s speech acts,

44 The law of attraction is a theory made popular through Mel Gill’s 2006 film *The Secret—Law of Attraction* and the bestselling book *The Secret* by Rhonda Byrne. Notice how the pursuit of happiness also fits the happiness discourse in Richard Powers’ novel *Generosity: An Enhancement*, however, with a genetic twist as opposed to the mystic power of positive thinking (see chapter 1 part 1).

and to an adult's speech in a foreign language (Dutch); and he compares her to a grown up with a past experience but no memory of it (Lentz's wife Audrey). Furthermore, Rick emphasizes the importance and trickiness of idiomatic expressions and metaphors. He also points out the craft of critique and independence in coming up with ideas, concepts, questions, and answers. Additionally, he even tests Helen against the edge of self-awareness and consciousness. All these criteria expose the complexity of what defines smart, what defines artificial intelligence, and what defines human intelligence or the human—which all become necessary to achieve human/technological evolution. However, the question that follows is whether language is enough of a gauge of intelligence, or whether experience is paramount, or whether experience along with language and memory are necessary for intelligence. Yet which knowledge and which experience are important, since context is not enough in making language meaningful for a machine?

b. Immersion in the Real World

The passage from the video "Sophia Awakens" stresses happiness and excitement in promoting Sophia as a robot that can express emotions, as an approach to humanizing AI. This is a breakthrough since, for many, and in particular Antonio Damasio, the obvious gap between humans and robots lies in affect and consciousness. However, Sophia's emotions remain programmed/taught and not felt.⁴⁵ Analogically for Rick, Helen lacks depth in verbal understanding because of her incapability to experience emotions.

I told her all these data, weaving from them a plot of well-formed sentences. But she would never get to their essence through sentences alone. I told her the term for that sensation we feel when some noun we slam up against triggers reengagement with the world's living concepts. But the tag did not yet let her feel anything close to the name's underpinning cascade.

45 Damasio distinguished between feelings and emotions.

Sensation was my lone river into the interior. More pictures and sounds. A bitmap was, even with fancy compression algorithms, worth a good deal more than 1K words. I thought to bruise her into concept. Soak her hands in the gush of pump water that all those parts of speech merely stood for. (*Galatea* 249–250)

According to Rick's observations, Helen's clumsy knowledge processing comes from her reversed word processing as opposed to human brain language processing.

Helen had to use language to create concepts. Words came first: the main barrier to her education. The brain did things the other way around. The brain juggled thought's lexicons through multiple subsystems, and the latecomers, the most dispensable lobes, were the ones where names per se hung out.

In evolution's beginning was not the word but the place we learned to pin the word to. Little babies registered and informed long before they invented more mama by calling her such. Aphasics, even deaf-mute sign aphasics, wove rich conceptual tapestries through their bodies' many axes in the absence of a single verb. (*Galatea* 248)

Abstract isolated knowledge, accumulated through learning alone, is not enough. Real life knowledge through experience of the world, feelings, and consciousness is crucial; and mostly, therefore, "juggling thought's lexicons through multiple subsystems":

[...] I could read Helen the poem that insisted no poem in creation stood comparison to one. But I could not lay out the difference between popular and academic, between hearth and hermeneutic, poetry and verse, nineteenth and twentieth centuries, Then then and Then now, between evocative simile and mind-fogging confusion, prewar sentimentality and the deforested poem-landscape just before that poet's death in the French trenches. Words alone would not explain to Helen the difference between "poem" and "tree." She could diagram, but she could not climb. (249)

In this respect, human language has supposedly more substance to it, carried by nuances and in first-hand experience instead of mere words and syntax. The variety of experience and the different modes of being also account for different ways of understanding and using language. This is, of course, to be evaluated against the dangers of generalization, since humans have different experiences, with degrees of limited first-hand experience as opposed to how some language expressions suggest universality of experience. Sources of discourse production (such as the television, books, and the internet) could portray a scene, a place, a person, or an experience that is unfamiliar to the audience, who in turn could interpret it only at face value against the background of what they know to be true, or on the basis of their own previous experience or imagination.

c. The Faculty of Perception

The mimetic faculty relies highly on perception, the perception of similarities that is a multilayered *non-sensuous* cognitive capacity (as seen in Walter Benjamin's "On the Mimetic Faculty").⁴⁶ Nonetheless, as seen in the novel, language processing and verbal recognition systems alone are not enough. Attention is thus drawn to visual systems. Visual systems connect machines to the outside world to enable them "immediate" perception of the "real world." This still lacks the sensation, but it is meant to remedy it. For this remedy to happen, it is not enough to understand the different regions of the brain and their functions. Advancing machine intelligence requires a deep understanding of the functions of each of the different essential human *organs* as well, especially those that mediate human interaction with the exterior world, such as the retina. As Ray Kurzweil puts it,

Hans Moravec, legendary and roboticist at Carnegie Mellon University, has analyzed the transformations performed by the neural image-processing circuitry contained in the retina. The retina is about two centimeters and a half millimeter thick. Most of the retina's depth is devoted

⁴⁶ For Michael Taussig, the perception involved in the mimetic faculty is, however, sensuous (Taussig, *Mimesis and Alterity: A Particular History of the Senses*).

to capturing an image, but one fifth of it is devoted to image processing, which includes distinguishing dark and light, and detecting motion in about one million small regions of the image.

The retina, according to Moravec's analysis, performs ten million of these edge and motion detections each second. Based on his several decades of experience in creating robotic vision systems, he estimates that the execution of about one hundred computer instructions is required to re-create each such detection at human-levels of performance, meaning that replicating the image-processing functionality of this portion of the retina requires 1,000 MIPS. The human brain is about 75,000 times heavier than the 0.02 grams of neurons in this portion of the retina, resulting in an estimate of about 10^{14} (100 trillion) instructions per second of the entire brain. (*Singularity* 123)

In *Galatea 2.2*, perception of the world in order to better fathom it and experience it is essential for human-like speech. Respectively, both *sensuous* and *non-sensuous* perception is fundamental for machine intelligence. For this, real-time robotic vision, although far from any human-like vision, enables a sense of depth and distance through multiple systems. The sense of distance is created by several cameras that are positioned at different angles and directed at the object and at the robot itself, along with sensors that measure intensity of contact; i.e., they measure the depth and the required pressure that is close to reality, which means a sort of sensuous perception (Suárez-Ruiz et al., "Can Robots").⁴⁷ The aim is to enable the machine in what Michael Taussig considers the basis of the sensuous mimetic faculty and that is "copy and contact" (*Mimesis and Alterity* 21).⁴⁸ When all elements of the mimetic faculty are fulfilled, human-like language and motion are possible to emulate in artificial intelligence.

47 See the example of the first robot to autonomously assemble an IKEA chair by Pham Quang-Cuong at Nanyang Technological University, Singapore in 2018.

48 Taussig's elements of sensuous perception in the mimetic faculty—copy and contact—refers, in parallel, to destructive contact such as the case of mobile digital means of mimesis, like the camera, when used on a drone in war attacks (Taussig, *Mimesis and Alterity* 27). This concept, therefore, creates contradiction.

d. *And the era of strong AI will have to start*⁴⁹

According to Ray Kurzweil, “The three tasks that have to do with human-level understanding of natural language—reviewing a movie, holding a press conference, and translating speech—are the most difficult” (*Singularity* 292). Therefore, he believes that “the era of strong AI” can then begin only at the point when machines master the three tasks, key to pass the Turing Test (292). Of these, understanding natural language is rated at the peak of human intelligence.

Dealing naturally with language is the most challenging task of all for artificial intelligence. No simple tricks, short of fully mastering the principles of human intelligence, will allow a computerized system to convincingly emulate human conversation, even if restricted to just text messages. This was Turing’s enduring insight in designing his eponymous test based entirely on written language. (*Singularity* 286)

Tracing the advancements in overcoming the challenge of natural language in AI gives a platform for assessing technological evolution. It is informative in the context of the milestones of technological evolution to compare the 1995 novel about AI (Powers’ *Galatea 2.2*) with the 2005 speculations about Singularity (Kurzweil’s *The Singularity is Near*), and achievements up until 2019 in humanoids or advanced robots (e.g., humanoid Sophia, humanoid Nadine as well as the IKEA-chair-assembling robot, etc.).⁵⁰ The improvements in AI capacity in the case of Sophia in terms of understanding natural language, participating at press conferences worldwide, with the faculty of facial and speech recognition as well as conversation in a “speaker-independent” fashion announces the “start of strong AI”—if we take into consideration Kurzweil’s prediction (*Singularity* 287; 292). However, a peep inside of robotics centers shows not only amazing progress and fascinating models, but also reveals that so many challenges still lay ahead, and that

⁴⁹ The expression is borrowed from Ray Kurzweil’s *The Singularity is Near* (292).

⁵⁰ Cf. Goertzel, Ben. “Human-Level Artificial General Intelligence and the Possibility of a Technological Singularity: A Reaction to Ray Kurzweil’s *The Singularity Is Near*, and McDermott’s Critique of Kurzweil” and “Loving AI: Humanoid Robots as Agents of Human Consciousness Expansion.”

the mundane skills and the three key tasks have not yet been mastered. Nonetheless, further advancements will certainly occur; just as deep neural networks shifted completely the way AI systems work, accelerating the use of AI after a downward slope due to the inefficient and tedious process of the initial artificial neural networks (Justin Dauwels, Personal Interview).

Galatea 2.2 reveals many challenges, but it also provides an evolutionary status of the Implementation as the narrative unfolds, exposing the machine's progress and transformation from basic in Imp A...until it reaches Imp C, and finally Imp H. The link to the present and to real-world AI is crucial in understanding such evolution. Humanoid Sophia is by far more evolved than Imp Helen in *Galatea 2.2*. Sophia is closer to Kurzweil's prediction of strong AI than Helen is. Kurzweil uses the term "have to" in his statement "and the era of strong AI will have to start" as if there was no escape from the upward curve in technological evolution (*Singularity* 292). It is a futuristic perspective that has its roots—as Kurzweil's analysis demonstrates—in a trajectory of accumulated knowledge and inventions from the past towards the future; and, therefore, mostly in "exponential growth." Basically then, Humanity is left with one option: to embrace the change through scrutiny with readiness to issue and implement necessary adaptive measures at the legal, ethical, scientific, and educational arenas. Individuals and societies have to start to envision methods of best integrating AI and to anticipate the outcomes of strong AI to be ready for all possible scenarios, positive and negative, and in the meantime remain on the track of advancement.

Although humanoid Sophia is still far from being more intelligent than humans, in some ways she is by far the most advanced humanoid to date and the most integrated as she bears a "citizenship." Even if her citizenship is problematic and she is still lacking in many skills, Sophia is a token of the evolution of technological advancement, and specifically AI thus far, and she represents an alarm that reaching such level in 2016 only means that this is the start of further advancements in AI. Progress enables further progress as far as exponential growth is concerned, based especially on the advancements in understanding and simulation of the different regions of the human brain and organs, and on advancements in artificial intelligence techniques, in speech/

verbal, facial, pattern, and visual recognition and processing as well as in artificial neuronal networks. In this form of technological evolution, all disciplines have to be ready for the change, either to contribute to it or to evolve with it with caution, anticipation, and positive adaptation. Preventive measures are equally necessary, and these require a revision of, and reform in, all fields—lest they become obsolete and porous institutions to the dangers of leaking incapacity in the face of new challenges and demands.

3.2 Mimesis Paradox: Evolving *through* or *beyond* Mimesis?

For Walter Benjamin, the object and power of the mimetic faculty evolve and change through history. In his article “Doctrine of the Similar,” he observes how the mimetic faculty of modern man has transformed from perceiving similarities in the sky and reading the stars to perceiving and producing similarities in language. For Michael Taussig, the mimetic faculty stands for “the nature that culture uses to create second nature, the faculty to copy, imitate, make models, explore difference, yield into and become other” (Taussig, *Mimesis and Alterity* xiii). He argues that “[t]he wonder of mimesis lies in the copy drawing on the character and power of the original, to the point whereby the representation may even assume that character and that power” (xiii). Taussig explores the shift in history of “representational security” from essentialism to alterity and constructionism as enacted through the Euro-American attempt at civilizing the colonized other. In his reading of Walter Benjamin, Taussig stresses the evolution of the mimetic faculty and the resurgence of mimesis as enacted via mechanical means of mimesis (the camera enabling film, advertisement, and mass destruction) as well as penetrating the body through surgery.

In the light of transformation, and in the light of technological evolution, humanoids are the expression of the human mimetic faculty in the era of AI. In their turn, for humanoids to achieve strong AI, they have to master the mimetic faculty as well. In practice, the process of creating strong AI oscillates between hype and disappointments. In the

novel, and contrary to Lentz's comforting speculations, Rick admits in disappointment: "I'd lost count of the number of neurodes involved. It had grown big, complex beyond belief. A glitch now set us back whole days at a time. The thing was a monster, distributed, unchartable, out of control. And yet Lentz's brain, or mine, was hundreds of millions of Imp B's wide" (*Galatea* 111). As Rick confesses, the human brain remains way more powerful than the "ersatz brain" that he and Lentz are pushing towards intelligence. This disappointment lies in their underachievement in creating a copy of the human brain's neural networks, in its advanced functions of autonomous speech and thought processing. Here, failure of the mimetic faculty resides in the incapability to engineer a compact entity of the artificial model—which is "spread all over the digital map" and thousands of processors—in contrast to the human condensed cerebral architecture and synaptic pathways (*Galatea* 111; 116).

Lentz's aspiration to recreate human brain neuronal networks along with brain plasticity and malleability in a pre-model of Helen, Imp C, shows such an endeavor towards human brain mimicry.⁵¹

The man [Lentz] was dangerous when he had a plan. He meant Imp C to be profoundly different in nature. He wanted to push the notion of the self-designing system up a level. Reweighting prewired connections would no longer suffice. Imp C would be able to strengthen or weaken the interactions between entire distributed subsystems. It would even grow its own connections from scratch, as needed.

Lentz wanted to get hundreds, perhaps thousands of large, interdependent nets up and running at the same time. He saw them passing endless streams of ideational tokens among themselves. The net of networks would churn at all times, not simply responding passively to new data inputs. When input stopped, it would interrogate itself in ongoing, internal dialogue. Its parts would quiz one another, associate and index themselves, even when alone. Imp C would undertake constant self-examination and reorganization. (*Galatea* 116)

51 "Since the 1980s, the artificial intelligence and neural networks in information technology have been inspired by the desire to mimic the human brain" (Bhushan, *Biomimetics* 30).

At the time when *Galatea 2.2* was published (1995), Imp C was an ambitious project and this remains the case today. The novel's latest version of the implementation, Helen, is a big step of technological evolution from the first version, Imp A. Also, it marks the shift from the basic methods of machine learning to deep learning. Today, research in the field has made some more progress and, as mentioned previously, comparing humanoid Sophia to the latest fictional version, Helen, stresses human achievements over the span of two decades. Sophia reveals a more advanced simulation of humans (in speech, emotional expressions, face, skin, body, and costumes (clothing)...) than Helen does. Sophia could be considered as a magnified, improved version of Helen, who tours the world giving talks at international conferences, with all capacities in one "body" and a human-like appearance, as opposed to the fixed Helen with an essence spread out over multiple machines located in different rooms at the center of advanced technologies at U.

Indeed, Ray Kurzweil stresses the outstanding and powerful performance of human brain regions, and he points out the numerous challenges in creating a non-biological intelligence that emulates human brain structure and functions with use of the techniques of biomimetics and human brain reverse engineering, through the implementation of artificial neural nets.⁵² Kurzweil admits that "[h]uman brains use about one hundred trillion computers (the interneuronal connections, where most of the processing takes place)" (*Singularity* 129). To assess human brain performance in the light of computer capacity is one step towards understanding how the brain and mind operate, as both Kurzweil and Pinker believe. Again, not forgetting that understanding how the brain and mind function opens up possibilities towards further technological evolution in the field of AI. On the other hand, *Galatea 2.2* leads to ask the question: How important is it to imitate, faithfully, biological intelligence? Since biological intelligence is already available, why would the

52 According to Bhushan, biomimetics is a term first coined by Otto Schmitt in 1957 and today refers to the recent highly interdisciplinary field that explores the various biological functions, structures, and principles in nature for adoption in human-made products for the purposes of efficiency, precision, aesthetics, or sustainability (Bhushan, *Biomimetics* 1-2). "At its most basic, biomimetics is the mimicking of living nature" (21).

threshold stop at creating an artificial equivalent of biological capacity and why would a faithful copy be an urgent matter?

The definition of a humanoid in the online Oxford Learner's Dictionaries reads as follows, "(of a machine or creature) behaving and looking like a human." This definition does not tell us of the engineering part of the machine and does not highlight the robotics or artificial intelligence it involves; instead, it is solely based on resemblance to humans in behavior and appearance. The same goes for the definition of the word human, which also comes as hollow. The definition of human (as noun) stands for "a person rather than an animal or a machine" (Oxford). Again, the definition of human is also based on difference from animals and machines, which does not refer to biological, intellectual, or spiritual traits. The definition of human (as adjective) elaborates three possibilities: 1) "of or connected with people rather than animals, machines or gods"; 2) "showing the weaknesses that are typical of people, which means that other people should not criticize the person too much"; 3) "having the same feelings and emotions as most ordinary people" (Oxford). In the previous definitions, both humanoid and human are mutually defined in contrast to or similarity with one another, no more. Also, ironically, in the second and third definitions of human as adjective, only emotions, feelings, and weaknesses are highlighted, without any reference to intelligence or consciousness.

Galatea 2.2 expands beyond simplistic definitions and explores complex notions, implications, and challenges. *Galatea 2.2* is a projection and a rethinking of paradigms and of futuristic possibilities. In the same manner, it testifies to the absurdity and limits of human imagination at a certain time in the past tested against the current time. In his article "Fortschritt: Die Angst vor neuer Technik ist so alt wie die Menschheit," Dietmar Seher explains that, in 1835, when Germany's first railroad connection between Nürnberg and Fürth was established—contributing to the industrial revolution—technology skeptics claimed that traveling at high speed by train would cause brain damage ("*Gehirnverwirrung*"), and that the airflow would result in pneumonia ("*Lungenentzündungen*") (Seher 1–2). The railway was condemned by some as the devil's work (Seher 1–2). Kurzweil's theory of the importance of thinking in terms of exponential growth, instead of linearity,

accounts for the constrained vision of humankind. Many picture robots as monsters. In this respect, neither Helen nor Sophia come across as monstrous. Meanwhile, and to date, Sophia is not the only non-monstrous social robot (intended to help humans in social services) available worldwide. In addition, many robotics laboratories rely on biomimetic techniques; engineering technological enhancements based on the functions and surfaces of plants, humans, or animals; such as shark skin and birds' beaks or wings, etc. (Bhushan; Vepa). So, what are the limits of mimicry then?

Here, I would like to argue that, instead of the mimetic faculty, *exponential growth* is based on the laws of *the alterity faculty*. By inventing cars, airplanes, and the internet (means of virtual communication), humans have surpassed, to a certain extent, any existing biological form of performance in terms of time-span effectiveness, spatial mobility, and quantity capacity. The project to recreate human intelligence faithfully (as questioned in *Galatea 2.2*) is a waste of human intelligence. Henry Ford argues that, if he had inquired about the expectations of his customers, they would have asked for “a faster horse” (qtd. in Isaacson 97). Instead, cars, which may have been in the beginning an imitation of biological means of transportation, are by far more effective for modern life and more powerful than horses and camels.

The airplane is not a faster bird either, although it comes closest to nature in comparison to migratory birds. Kurzweil suggests that “[o]ur flying machines, for example, do not attempt to re-create the physiology and mechanics of birds. But as our tools for reverse engineering the ways of nature are growing rapidly in sophistication, technology is moving toward emulating nature while implementing these techniques in far more capable substrates” (*Singularity* 146). Especially at its infant stages, innovators have on many occasions taken inspiration from the environment, the richness of the varieties of beings, and natural resources, and they started at times by imitating nature. Indeed, Abū'l Qāsim 'Abbās b. Firnās—the first man to briefly fly in 875 A.D. in Andalusia—performed by imitating birds as he covered his body in feathers (White, “Eilmer of Malmesbury”). The method, although highly important as a first attempt, is much more limited compared

to airplanes and gliders⁵³ (which, according to White, are an imitation of kites). Hence, imitation remains a crucial starting point in paradigm shift and it is equally a constant orientation for some further developments.

The birth of the field of biomimetics in late 20th century has helped in harnessing many existing technologies.⁵⁴ However, both of the engineers Bharat Bhushan and Ranjan Vepa weigh the value of inspiration from nature against the imitation of nature, and they stress the importance of transcending mimicry (Bhushan, *Biomimetics* 28; Vepa, *Biomimetic Robotics* 34). Nonetheless, both imitation of, as well as inspiration from, nature are not enough.⁵⁵ For instance, the evolution of aviation, as depicted by Lynn White Jr. in his article, “Eilmer of Malmesbury An Eleventh Century Aviator: A Case Study of Technological Innovation, Its Context and Tradition,” developed from a body covered in feathers (in 875), and attaching wings (in 1000/1010), to designing kites, the Zepelin (in 1930), gliders (in 1884), and in 1900 a kite glider with a pilot and motor-driven propellers. Mimicry at the level of feathers in a literal manner for flying is insufficient as it superficially replicates the surface, i.e., the feathers, while neglecting the importance of the neurological connections for muscle reaction and the complex structure of wings.⁵⁶ On the other hand, the mechanics necessary for artificial flight (be it gliders, airplanes, or drones) differ from the mechanics of the natural ability to fly (be it in birds or dragonflies). The effects of wind alone, to name one factor, are different when compared in natural and artificial flying. In *Biomimetic Robotics*, Vepa demonstrates that, in order to maximize the performance of airplanes, inspiration from the structure and mechanics of bird wings—by implementing the mechanics of the alula, a thumb-like feather—also requires inspiration from humpback whale fins and shark skin to reduce drag and improve lift in artificial

53 Arthur L. Samuel also argues in his article “Artificial Intelligence”—in an attempt to discard the need to recreate the brain—that failure in flying happened when man solely observed birds and that successful trial happened when man started studying aerodynamics (14).

54 Bhushan, *Biomimetics* (ix; 1).

55 Ranjan Vepa argues that “one of the objectives of biomimetic control is to surpass and go beyond biomimicry” (*Biomimetic Robotics* 34).

56 In his book *Biomimetic Robotics*, Vepa gives a detailed description of the mechanics and structure of the wings and neuromuscular system of the bird.

flight (34–38). This is why mimicry, especially if performed in superficial faithfulness to the form or action or to one natural example, is limiting. Aiming at complete faithfulness is unnecessary, if not impossible. Therefore, in *Galatea 2.2*, the irony of aiming to capture human intelligence in full reflects an equally crooked mimetic faculty. It points out similarities in intelligence and differences in, or a lack of, eloquence.

In his “Doctrine of the Similar,” Walter Benjamin stresses the transformation of the mimetic faculty (the faculty of perceiving similarities) through time (history) and how it moved from the non-sensuous mimetic faculty of reading the future in the stars to a higher form of non-sensuous mimetic function enacted through reading, language, and writing in its “most volatile and delicate substances” (Benjamin, “Doctrine” 68). He further explains that “in other words: it is to writing and language that clairvoyance has, over the course of history, yielded its old powers” (68). Benjamin also comments on the evolution of the mimetic faculty; he concludes that “[t]he gift which we possess of seeing similarity is nothing but a weak rudiment of the formerly powerful compulsion to become similar and also behave mimetically” (69). In this light, biomimetic technology is an attempt to restore a *conscious*⁵⁷ mimetic faculty through coding and programming⁵⁸ and through simulations.⁵⁹

Analogously, perceiving the world through exponential growth transforms the method of reading. Perceiving the world through the lens of all the patterns that accumulate from history, findings, innovation, as well as socio-economical and evolutionary patterns transforms the method of reading the future through the stars (but also reading through words, as Benjamin examines), replacing it with reading the future of humans and technology through the patterns of exponential growth and through not only words but also statistics, behavior, innovation over the course of history, and coding/programming languages. The mimetic faculty transforms, where image crafting becomes a fully blown 3D object, clearly in recent innovations like Sophia, and where

57 I use here conscious as opposed to Benjamin’s unconscious mimetic faculty designated as “a weak rudiment” (Benjamin, “Doctrine” 69).

58 Here, programming language is meant instead of spoken and written natural language.

59 Simulations in the engineering sense of the word.

human natural language reveals complexity in the attempt of its imitation. This is also the case for Helen in *Galatea 2.2* at the levels of learning, language processing, autonomous thinking, and consciousness similar to the human. Creating a machine to learn the “human highest function of mimetic faculty,” as Benjamin considers the mimetic function, thus remains a challenge.

The mimetic function remains possible only through creating difference. The problem of Helen’s redundant language processing lies in her lack of a human “mimetic faculty,” i.e., her lack of seeing the similarities, or perceiving the word image in spoken and written language like a human. However, Helen’s reading has to be constructed in ways that are different from human reading. Thus, the machine mimetic faculty is embedded in different processes and techniques of language development through programming languages, algorithms, and artificial intelligence techniques of machine supervised learning, deep neural networks, as well as speech recognition and processing.

Galatea 2.2 constantly compares and contrasts machine learning to human learning (which constitutes reverse engineering of the human brain). Ray Kurzweil—who himself highlights the importance of the human brain “software”—also reminds us of the difference in machine learning by also contrasting the two (*Singularity* 145). He argues that, unlike human knowledge accumulation (e.g., learning French, reading a novel...) that requires long processes of tedious slow learning for each person individually, machines have the advantage of being able to share or download information (145–146). He further elaborates:

[...] At one of my companies, we spent years teaching one research computer how to recognize continuous human speech, using pattern-recognition software. We exposed it to thousands of hours of recorded speech, corrected its errors, and patiently improved its performance by training its ‘chaotic’ self-organizing algorithms [...] Finally, the computer became quite adept at recognizing speech. Now, if you want your own personal computer to recognize speech, [...] you can simply download the already established patterns in seconds. (*Singularity* 146; [my omissions])

Therefore, simulating human functions according to Ray Kurzweil should be simplified, changed, and not carried out identically and faithfully. He insists that the result, and not the manner, is the thing to highlight. He explains:

We will discuss the state of human-brain reverse engineering later, but it is clear that we can emulate the functionality of brain regions with less computation than would be required to simulate the precise nonlinear operation of each neuron and all of the neural components (that is all of the complex interactions that take place inside the neurons). We come to the same conclusion when we attempt to simulate the functionality of organs in the body. For example, implantable devices are being tested that simulate the functionality of the human pancreas in regulating insulin levels. These devices work by measuring glucose levels in the blood and releasing insulin in a controlled fashion to keep the levels in an appropriate range. While they follow a method similar to that of a biological pancreas, they do not, however, attempt to simulate *each* pancreatic islet cell, and there would be no reason to do so. (*Singularity* 124)

Thus, *the alterity faculty* holds a higher level than the mimetic faculty. *The alterity faculty* in this chapter is a deviation from the meaning, inspired but not faithful to Michael Taussig's "alterity," and it is a deviation from Walter Benjamin's mimetic faculty. Taussig's "alterity" resides tightly in mimesis, where he reads Benjamin's passage of "the gift of seeing resemblances [...] is nothing other than a rudiment of the powerful compulsion in former times to become and behave like something else" (qtd. in Taussig, *Mimesis and Alterity* 33). In this passage, the "something else" is referred to as something other by Taussig and, therefore, as "alterity." For Taussig, "alterity" bears complex layers of meanings: as an opposite concept to the term mimesis; and also as an overlap with similarity, where by means of mimesis the copy becomes the origin, or the mimicking is mimicked, the mimicking is othered; and/or as a reference to the spiritual side of the material copy. Like the term mimesis, the term alterity by Taussig falls under paradigms of ethnicity, post-colonialism, and commodity fetishism.

However, my use of the term in combination with faculty relies mostly on both a *sensuous* and a *nonsensuous*—also a conscious and an unconscious—capacity of reading, using, creating, and boosting variations, dissimilarity, divergence, and distinction as an asset to evolution. *The alterity faculty* as a solution for technological evolution is meant as going beyond, becoming different, creating what is beyond the copy, beyond the represented or the imagination, and aiming for the next level of things and beings. It resides in finding solutions through building differences instead of sheer perception, or proliferation, of similarities. Artificial intelligence would reach astounding intelligence or strong AI status only if it is capable of acting in *alterity* to humans and not in imitation of humans in the same fashion that airplanes are different from birds.⁶⁰

It is no longer similarities, rather it is conscious and aspired dissimilarities—for the sake of creating the split—that allow evolution. It is creating with variations beyond the doctrine of the similar. Evolution is thus generated through variations, through the law of split. The split is intended to leave the origin, the copied, far behind and surpass it in every possible way. It is also a split from dystopian anticipation, so as to overcome the destructive element of imitation and contact. The idea of the split in anticipation is to go beyond the doomed stigmatization of technology as destructive technology.

3.3 Artificial Intelligence: Interdisciplinary Plasticity

The alterity faculty thrives in interdisciplinarity. Along with the human-machine merger, *Galatea 2.2* adds a merger of literature–technology, placing interdisciplinarity at the heart of technological evolution. The

⁶⁰ In his book *Evolutionary Approach to Machine Learning and Deep Neural Networks*, Hitoshi Iba reflects on the possible evolution of robots beyond current imagination; he states, “[t]he form of organisms we know about may be only those species that are remaining on earth. These may be types that match the earth environment, and it is not known if these are optimal. Through evolutionary computation, if we can reproduce the process of evolution on a computer, new forms may emerge that we do not yet know about. The result may be the evolution of robots compatible with Mars and unknown planets” (Iba, *Evolutionary Approach* 15).

experiments at the laboratory in *Galatea 2.2* put to test the hierarchies between the humanities and advanced sciences. In the novel, the Turing test aims to validate whether the machine could compete with human intelligence and human soft skills, specifically in the domain of literary criticism. Surpassing human capacities by means of programmable technologies—as discussed before—is critical at the soft skills level. These are more complex to automate than expert systems (as explained by Kurzweil; Pinker; Cuong; and Stevens). Therefore, knowledge engineering, interpretation, and critical thinking are portrayed at the highest levels of cognitive complexity in *Galatea 2.2*—as well as by Kurzweil and Pinker. Hence, the humanities and the sciences blend in the novel.

The question remains, what is the use of literature in advancing AI? And what is the use of literature within all these disciplines that could contribute to the advancement of technology or human intellectual capacities in the fields of science and technology? If cognitive neuroscience contributes to a better understanding of brain functions and cerebral architecture, how could literature promote a deeper understanding of human capacities or those of technology? There lies the irony in the bet in *Galatea 2.2*. It highlights the complexity of, and the importance of, “software” in reverse engineering and biomimetics and points out that hardware engineering alone is insufficient (see Kurzweil; Pinker). The brain is complex in its architectural structure of the different neuronal connections and information processing pathways, which machine learning aspires to capture through deep neural networks in order to create machine intelligence plasticity. However, critical thinking remains a missing link in artificial intelligence, and here comes the importance of literature—as exposed in the novel.

In the novel, the question extends to the kind of literature that has to be fed into the simulated brain in order to automate literary criticism. Following old school belief, Rick feeds the machine (Helen) with the canon; while in opposition, the literature student (A.) protests the method and promotes a discourse of diverse and minor literature.

On the one hand, *Galatea 2.2* reveals layers of complex systems and functions, that are interconnected, in enabling some “apparent” ordinary capacities (also addressed by Steven Pinker). On the other hand, it equally treats high-intellectual human capacities such as language

development, natural language, conversing, conversing with more than one person, critical thinking, experience of the outside world, building memories of shared experience, the emotional dimensions of language, language nuances, understanding idiomatic expressions and irony, *sensuous* and *nonsensuous* perception, and producing autonomous thought. Pinker claims: “But the gap between robots in imagination and in reality is my starting point, for it shows the first step we must take in knowing ourselves: appreciating the fantastically complex design behind feats of mental life we take for granted” (*Mind Works* 4).

The evolution of the mimetic faculty transforms into the alterity faculty via interdisciplinary thought. Therefore, technological evolution is enabled only through the faculty of interdisciplinary thinking, conversing, and reading. Interdisciplinarity becomes a key to plasticity, malleability, and transformation, and the core to exponential growth. Hence, artificial evolution requires a case of interdisciplinary plasticity in the machine.

Kurzweil claims that “the complexity of our brains greatly increases as we interact with the world (by a factor of about one billion over the genome)” (*Singularity* 147). Now imagine the richness of civilizations when they are exposed to and “interact with” the world. Ray Kurzweil on human memory capacity and expertise states:

How does computational capacity compare to human memory capacity? It turns out that we arrive at similar time-frame estimates if we look at human memory requirements. The number of ‘chunks’ of knowledge mastered by an expert in a domain is approximately 105 for a variety of domains. These chunks represent patterns (such as faces) as well as specific knowledge. For example, a world-class chess master is estimated to have mastered about 100,000 board positions. Shakespeare used 29,000 words but close to 100,000 meanings of those words. Development of expert systems in medicine indicate that humans can master about 100,000 concepts in a domain. If we estimate that this “professional” knowledge represents as little as 1 percent of the overall pattern and knowledge store of a human, we arrive at an estimate of 107 chunks.

Based on my own experience in designing systems that can store similar chunks of knowledge in either rule-based expert systems or self-organizing pattern-recognition systems, a reasonable estimate is about 10^6 bits per chunk (pattern or item of knowledge), for a total capacity of 10^{13} (10 trillion) bits for a human's functional memory. (*Singularity* 126)

Kurzweil carries on explaining the possible technique of human brain simulation/recreation for memory capacities in machines

Based on the above analyses, it is reasonable to expect the hardware that can emulate human-brain functionality to be available for approximately one thousand dollars by around 2020. [...] the software that will replicate that functionality will take about a decade longer. However, the exponential growth of the price-performance, capacity, and speed of our hardware technology will continue during that period, so by 2030 it will take a village of human brains (around one thousand) to match a thousand dollars' worth of computing. By 2050, one thousand dollars of computing will exceed the processing power of human brains on Earth. Of course, this figure includes those brains still using only biological neurons. (127; [my omissions])

For technological evolution to happen, creating an artificial brain requires simulation of interdisciplinary minds, instead of reduced functional and disconnected patterns. In turn, technological evolution can create a platform to enact and access a merger of full interdisciplinary connections. Now, if this happens in human brains, if now one multiplies human brain capacities by the number of human brain capacities in a civilization and the interaction with different disciplines and cultures—by means of access to an interdisciplinary form of AI—how rich and dynamic does the civilization become within a comparatively short time span and in the long run?

In part I of this work, I revealed the complex dynamics emerging from the nascent fields of biomedicine, genomics, biotechnology, cognitive neuroscience, and artificial intelligence. I exposed, therefore, the complexity of human gene editing, and the connectivity in the genomic make-up. I revealed the complexity of human brain architecture and

functions, as well as its plasticity and malleability and, finally, how complex it is to create a simulated brain in its highest levels of cognition and layered neural networks via deep machine learning. In the three chapters, I stressed, therefore, the tendency towards means of artificial evolution via human genetic engineering, brain intervention and malleability, as well as recreating the human brain via an artificial intelligence that redesigns interdisciplinarity in its systems. In the next part of the book, I deal with complex human interconnections and the progress–regression paradox, by exploring civilizational dynamics, clashes, and global crises. The following part explores civilizational evolution through restraint and variations.

Part II Civilizational Evolution: Restraint and Variations

Part II, “Civilizational Evolution through Restraint and Variations,” builds on the previous chapters that are based on the different types of artificial evolution. However, it looks at the notion of the “alterity faculty”—in going beyond the doctrine of similarities and going beyond the stigmatization of destruction—under different lights. Creating variations and dissimilarities is here placed within the context of civilizational interaction and contact. These are highlighted in the analysis of two of Richard Powers’ novels (*Generosity: An Enhancement* and *Plowing the Dark*). The events detail clashes and mutual ruination and stress the importance of hybrid identities and variations within a platform of human exchange. Therefore, chapter four of this book explores conflicts specifically with a focus on clashes between groups of the same nation, the same religion, or the same ethnicity. By so doing, it offers a critical reading of Samuel P. Huntington’s *The Clash of Civilizations? The Debate* and his theory of clashes that is based on natural demarcations of civilizations and the natural evolution of wars.

The novels reveal a different understanding of civilizations and conflicts—ones that are complex and constructed, rather than natural. In parallel, they expose how hybridity and interdisciplinarity are crucial elements in the survival of civilizations. As understood from the novels, refrain from evolution in interdisciplinary thinking entails a cessation in the evolution of civilizations, marking instead their regression. Desisting from interdisciplinary reading, thinking, writing, and dialogue paves the way for conflicts, where destruction prevails. In this respect, chapter five examines the impact of global crises (in wars and terrorism), pointing out human regression despite technological advancements.

Both *Generosity* and *Plowing the Dark* reveal that variations harbor a platform ripe for outcomes, ranging from peaceful co-existence to conflicts and violence. This orbit of possibilities of evolution or regression, of creating sustainable co-existence, or a pattern of mutual devastation hovers over all civilizations—as seen in the two narratives. Unlike Huntington, the novels offer a different view on the growth of civilizations that is based on enriching contiguity. Going beyond (towards the different and the similar)—in reciprocal peaceful contact without wreaking havoc—is an act of evolution that surpasses wars, built on a

condition of refrain from all forms of violence. It is not the survival of the fittest that matters here but the co-survival of variations in contact and interaction without destruction.

When a civilization collapses, it leaves mark in ruins and historical accounts. In similar ways, endangering variations of ethnicities and identities leaves deep scars engraved in the human collective memory and past. For some, these are used, in turn, as a motor for further conflicts, revengeful responses, or the struggle for power. Tensions between superpower states drag along global unrest, sustaining disparate fractures and instabilities like dormant volcanoes ready to erupt at the next national or global crisis. Decisions of going to war, attacking a nation, a group of different or similar identities, are igniters of future sources of conflict in erratic loops that are given logical diplomatic and undiplomatic reasons. In this respect, war has no right to reason or identity. Samuel Huntington's claim otherwise builds up a rigid grouping of peoples that is supposedly embedded in a fixed natural identity towards violence. For him, based on civilizational demarcations, modern wars and conflicts are explained and unchanged. Huntington holds conflicts as natural and obvious; his world is clearly and neatly charted through the purity of civilizations.

On the other hand, Richard Powers' novels *Generosity: An Enhancement* and *Plowing the Dark* offer a messy palimpsest of hybrid identities and of conflicts between groups of the same nation, same religion, or same identity. His narratives hint at the Iran–Iraq War, the Lebanese Civil War, the Persian Gulf War, terrorism, and attacks on Kabyle minorities in Algeria, which do not stand as mere exceptions to Huntington's normalized rule on civilizational clashes but rather prove it fallacious.⁶¹ They echo, in the novels, the absurdity of ascribing a civilizational identity and an evolutionary pattern to war.

In *Generosity*, the character Thassadit Amzwar becomes an emblem of the possibilities of identity variations in multi-layers. She is an Algerian, Kabyle, “half-Christian atheist,” descendent of a Catholic family, refugee to Canada, and on a student visa in the United States of Amer-

61 Cf. Testas' “The Roots of Algeria's Religious and Ethnic Violence.” *Studies in Conflict and Terrorism*, 2002, pp. 161–183.

ica (*Generosity* 49–51). Her stories in Russell Stone’s class enrich the narratives of creative non-fiction assignments. Her writings depict a fascinating Algerian culture prosperous with lush heritage and, at the same time, a chaotic situation under the attacks of Islamist terrorist groups in the 1990s. The contrast in richness and chaos due to the differences resonates in an absurdity of human conflicts.

In *Plowing the Dark*, most characters have an immigrant background, all contributing to the diverse patchwork of the American workplace in the novel. The characters come from different ethnic backgrounds—but also different educational programs—and all meet at the Realization Lab in Seattle and work together on an advanced form of virtual reality space (“the Cavern”), where art and technology meet. On the other side of the world, in Lebanon (still in *Plowing the Dark*), the character Taimur Martin holds a multidimensional emblematic stance. Taimur’s hybrid identity of being half-American, half-Iranian (descendant of a mother with Shi’ite Muslim faith) is an emblem of the contact of identities without destruction (Powers, *Plowing the Dark* 50). However, being captured as a hostage in Lebanon, possibly by a Shi’ite Islamist Terrorist group during the invasion of Kuwait and the start of the Persian Gulf War, Taimur represents another emblematic form of the irony of civilizational wars. Hence, the oscillation between richness and complexity—created at the heart of these variations—opens up a deep pit inside the logics of war and conflicts.

The first chapter of part II, “Clashes and Hybridity,” begins with the rise and fall of civilizations. These come within the contexts of a historical account of the Islamic Golden Age and Tunisia’s civilizational make-up, traced over a *longue durée*. The analysis expands to explore clashes at the micro-levels between groups of the same nation, religion, or ethnicity. This addresses the Civil War in Algeria, the Lebanese Civil War, Iraq–Iran War, Iraq’s attack on Kuwait, and the Persian Gulf War that are hinted at, or elaborated on, in the novels *Generosity: An Enhancement* and *Plowing the Dark*. The setting thus ranges from the 1980s to the 1990s, and goes back 4000 years in the example of Tunisia. The chapter focuses on Richard Powers’ instances of clashes between groups with similar identities, which debunk Huntington’s civilizational theory, highlighting more complex factors and fluid map delineations.

The second chapter of part II examines the smart weaponry and virtual aspect of the Persian Gulf War with a focus on Jean Baudrillard's and Slavoj Žižek's views. The two chapters thus display a range of conflicts based on complex and absurd incentives, which highlight power relations and fake motifs. This builds up an urge to go beyond pseudo-reasons for war; and it rather evokes a form of restraint from violence, where there is no aesthetic to aggression and destruction. In such patterns, therefore, variations and restraint become key in civilizational evolution.

Chapter 4 Clashes and Hybridity

4.1 Micro-demarkations

Generosity: An Enhancement encompasses a historical account that conveys the gist of transformational civilizations through their interactions and exchanges, rise and fall, as well as contributions to knowledge. It also captures “clashes within civilizations.”⁶² By so doing, it delineates at the same time how wars and the hindrance of interdisciplinary thought constitute keys to regression—if not the fall—of civilizations. In *Generosity*, reality TV show reporter, Tonia Schiff, thinks the following to herself during her trip to Tunisia:

Look at me—as Islamophobic as anyone. Phobic of contemporary Muslims, anyway. For Golden Age Muslims, she feels the respect most people save for dead patriots. Alhazen, Avicenna, Averroës: advancing science when Europe was still waist-deep in angels and devils. Then something happened. Exploration stopped, replaced by received wisdom. Observation, washed away by certainty. (Generosity 87)

The above passage hints at the Islamic Golden Age and the interdisciplinary thinkers and inventors of that age; namely: Alhazen (Ibn al-Haythem), Avicenna (Ibn Sina), and Averroës (Ibn Rushd). This era marks—with its erudite thinkers in the “Muslim” worlds—a peak into medical, philosophical, and astronomical research as well as to experiments and inventions. The illustration taken from *Generosity* evokes how the rise of civilizations depends—in large part—on knowledge production, exploration, and critical thinking, embedded in “interdisciplinary” erudition and intercultural exchange. Indeed, the example of the Islamic Golden Age hints at how societies and the sciences prospered thanks to openness to hybrid cultures and “interdisciplinary” research. The take on knowledge at that time was not divided into disciplines in the manner of modern practices, but it was rather encyclo-

62 Slavoj Žižek, *The Desert of the Real*.

pedic—in similar ways to the Greek legacy (Hill, *Islamic Science* 9). In his book *Islamic Science and Engineering*, Donald R. Hill, stresses that, in ancient Greek and medieval Arabic, the term “science”—(in Arabic ‘ilm علم)—is strictly different from the modern understanding of exact sciences (9). In medieval Islamic scholarship, “science” constituted an umbrella term encompassing “theology, philosophy, logic and metaphysics” besides “astronomy, mechanics” and medicine, etc. (9).⁶³

This is seen in the eclectic expertise of the scholars of that time and in the establishment of the House of Wisdom (*Bayt al-Hikma* بيت الحكمة) in Baghdad (by Harun al-Rashid’s son, al-Ma’mun) (Hill 11).⁶⁴ In the Middle Ages, the House of Wisdom functioned as a meeting point library, or more accurately, as a hub for scholars from different backgrounds and cultures, and a translation station of texts from all civilizations (Hellenistic, Roman, Egyptian, Byzantine, Indian, Persian, and Chinese, etc.).⁶⁵ Caliph al-Rashid himself had contributed to the expansion of the translation practice and to the collection of world scholarly works by founding “The Treasury of Knowledge library” (*Khizānat al-Hikma*) (11). Other examples of initiatives to promote knowledge and research included the opening of schools (*madrassa*) in the second half of the eleventh century and universities that hosted scholars from all over the world (Bennison 89).⁶⁶

Indeed, at a time of “gradual decline” in the sciences in the Roman Empire through the early Byzantine era, the Arabic translation movement extended from the early Abbasids (8th century) in Baghdad until

63 Cf. Amira K. Bennison, *The Great Caliphs: The Golden Age of the Abbasid Empire* (158–160).

64 Bennison points out the contradictions in historical accounts concerning *Bayt al-Hikma* and attributes its establishment to caliph al-Mansur (instead of al-Ma’mun or Harun al-Rashid), as, according to her, it had already been established in the 8th century, 50 years before al-Ma’mun’s reign (ibid. 98, 179).

65 Donald R. Hill’s book *Islamic Science and Engineering* sketches several passages of knowledge transfer and accumulation during the Islamic Golden Age. In her book, Bennison insists that the Golden Age’s scholars contributed to knowledge through “innovative and path-breaking additions” instead of mere transfer of scholarship (*The Great Caliphs* 175).

66 Bennison explains that “the most famous” school (*madrassa*) was founded in Baghdad in 1165 and might possibly be the origin of the system of state schools (89). Such schools spread towards the East “through Syria in the eleventh century into Egypt,” and they extended to “Morocco and Spain in the fourteenth century” (89). Cf. Donald R. Hill, *Islamic Science and Engineering* (9–13).

the mid-eleventh century in the East and Al-Andalus, attributing a “cosmopolitan character” to the cities (Hill 9; 13). The translation movement and research thrived under institutionalized centers and governmental financial support to eclectic savants from various cultural and religious backgrounds, and fields of interest, which contributed to the advancement of medicine, astronomy, technology, and philosophy—among other “disciplines” (Hill 11–12; Bennisson 159, 175–177). In addition to their method of extensively accumulating world scholarship, the thinkers brought improvements to existing research, and inventions followed—leading to flourishing intellectual contributions as well as innovative engineering constructions and machinery (Hill 11–12; Bennisson 159, 175).

As implied in *Generosity*, knowledge production is the motor for thriving civilizations. On the other hand, the decline of research and critical thinking (along with a lack in reform and innovation, limited access to equipment and information, and resentment of interdisciplinarity) fosters dependence at all levels. This establishes a platform for prevailing ignorance, where dialogue becomes limited. When critical thinking and knowledge production stop evolving, everything else follows in regression.

On the one hand, it is pressing for scholars in the region to re-think, re-write, and re-invent what has become fixed during a period of stagnation. The urge stems from a need to restore the void of the almost-absent knowledge production and a sort of passive dependence on research and innovation over the past centuries. At the margins of such a vacuum, the rise of terrorism takes over in the media. As of modern times, terrorist groups and ignorance tarnished the image of the Islamic, Arabic, and Persian worlds, resulting—as seen in Tonia Schiff’s statement—in a systematic spread of Islamophobic sentiments. It is obvious that the twist is amplified in media misrepresentations and generalizations, which, in turn, efface the voices of modern progressive thinkers and pacifists and rather fill the void with images displaying hatred and brutality as omnipresent. Once erudition and dialogue are replaced with ignorance and iconoclasm (in the form of terrorism, wars, and misrepresentations), civilizations regress. In similar ways, Tonia Schiff’s observations sound the alarm against the abyss of regression that her

country (the United States of America) could begin to face if limitations on science and innovation are stifling. The narrative goes as follows:

Much the same is happening again, this time on [Tonia] Schiff's branch of the family tree. Her own government has long crusaded against all kinds of science, secure in the revealed knowledge they needed. Now Schiff herself wades into the middle of a fray that might just turn the moderate American citizen against any more discoveries. (*Generosity* 87)

Again, a sample of earlier civilizations' merging, rising, and falling is apparent in the streets and archeological sites in Tunisia—as depicted in the following extracts taken from *Generosity*:

And on a May night in the near future, Tonia Schiff will land at Tunis-Carthage International [...] so much flickering enterprise up so late, refining fresh surplus into new necessities. Tunis glitters as furtively as any of the earth's two-hundred-or-so-million inhabitant cities. This one just happens to be four thousand years old.

The science-show host wakes up in the *Centre Ville*, feeling that she's landed by mistake in southern Italy. Only the palms along Mohammed v reassure Tonia. And these turn out to be just a holdover French colonial fantasy [...]. She climbs through the Belvedere, loses herself in the tight medina maze, strolls through the bey's palace. She stands overwhelmed in the heart of the suq [...] (143; *my omissions*)

Part III of the novel carries on,

Schiff's guidebook says to keep watch off the right side of the road, at about one hundred kilometers. The Peugeot crests a hill, and down a wide expanse spread the ruins of Dougga. Tonia cries out in admiration. One of the passengers [...] leans forward and says, "The best Roman Town in North Africa. Edge of the empire."

The woman next to him objects with her whole body. Not Roman, she says. Numidian. Then Libyco-Punic.

Her other seatmate [...] claims that the Numidians stole it from the Berbers. The driver plunges into the fray, and the debate turns violent in three languages, only one of which Tonia can follow. The argument over who built the city turns into a fight over who killed it – the Byzantines, the Vandals, the Ottomans, the French, or the UN World Heritage folks.

“No one killed it,” the driver declares, in a voice suggesting that anyone who disagrees can walk the rest of the way to El Kef. “The land just dried up. The damn empire fell apart. What do you do about that?” (*Generosity* 176; [*my omissions*])



Fig. 1 Dougga (Left), Tunisia, 2019 ©Michael Cerny; Carthage (Right), Tunisia, 2019 ©Ines Ghalleb, both: CC-BY 4.0

As the previous excerpts show, on the basis of the survival of the fittest, there is no fittest and therefore no survival. All civilizations have collapsed, giving way to a dynamic change in power and geo-political formations. In the cited example, Tunisia is used as a token of such thriving of different civilizations and their collapse over a period of 4,000 years. Tunisia witnessed the rise and fall of the Berbers, Carthage, the Roman Empire, the Byzantine empire, the Vandals, Arab Muslim dynasties, the Ottoman Empire (and the Bey regime), then the French colonial period. In recent events, this is also true for the first republic of Tunisia. Such civilizational dynamism also drags with it dynamism in civilizational identity and diversity. The heritage of each culture (even if it goes back thousands of years) creeps into every other successive civilization. The accumulation of diverse heritage (through the changing civilizational formation) further creates paradox and plurality in the current country’s identity. Similarly, present-day changes in ideologies, regimes, practices, and opinions bring about changes to the preceding identities, symbolism, and systems.

In *Generosity*, the passage where Schiff is said to arrive at Tunis-Carthage and then travel to El Kef highlights the smell of Jasmine as the smell of adventure and mystery. The passage reads: “Toward sundown, the flower vendors creep out to thread the cafés with jasmine garlands. A tiny white snail of a flower, whose scent is like falling down a bottomless well: solvent, secret, and as strange as sex, with final arrival lying just a few inches below reach... Tonia Schiff might have come to this place for that smell alone” (*Generosity* 143). The shift in the symbolism of the flower Jasmine in the second republic of Tunisia again points out civilizational dynamism. In post-revolution Tunisia, Jasmine flowers take another dimension of significance as the Tunisian Revolution was named after them; the Jasmine Revolution.⁶⁷

Although the “Jasmine” revolution has been the only successful revolution in the Middle Eastern and North African region, it has shown the precariousness and complexity of how different groups of the same nation clash for the sake of power. The divide due to parties’ polarities and combinations polarized the nation (a nation of at least 90% Sunni Muslims) on the basis of the degrees of “religious piety”; those who deemed themselves more religious *versus* those labeled as less or non-religious, especially during the first interim government. Until today, the high rate of university educated people (women and men) in Tunisia, the rise of active youth (women and men) in civil society, the high number of women’s rights organizations, the pioneering spirit of the country, and the well-established systems have made the transition to democracy relatively smooth, although the challenges are still manifold. The political instability within the country and at the borders at that time paved the way for terrorist attacks, ironically again underlining the absurdity of religious conflicts. Islamist terrorist groups are as oblivious to religion and humanity as any other absurd reason for war: their violence disguised as religion is a camouflage for what their void mission bears.

67 The name *Révolution de Jasmin* was coined in the French media. Although it is commonly used by Tunisians as well, some protest the naming. The term is also translated into Arabic: (*Thawrat al-Yasmine* ثورة الياسمين). It is also important to note that some argue that the revolution in Tunisia was only an uprising. For others, it is indeed a revolution.

The rise of violent Islamist groups in Algeria in an earlier time (1991), as seen in *Generosity*, did not spare the lives of some Algerian Kabyles and secular civilians in the face of their compatriots, who dragged the country to the brink of a civil war—“*la sale guerre*” (“the dirty war”), as it is called in Algeria (*Generosity* 29).⁶⁸ Having different ethnic and religious backgrounds did not require a geo-political positioning across civilizations for conflicts to happen. Sharing the same national identity did not prevent the clashes, either. The passage reads as follows:

[...] *Alger la blanche*. Postwar? Prewar. Midwar, now and always. Holy war. *La sale guerre*. Half a century of war that has emptied the country of a third of its people. The zeal of recent independence has turned on itself, and the state manufactures new enemies everywhere. The Islamic backlash against kleptocrat tyrants escalates into a mass movement. The separatist Berber Spring comes and goes, not so much suppressed as deferred into a simmering Berber Summer. *Reculer pour mieux sauter...* (*Generosity* 29)

The following excerpt continues:

[...] The Islamic Salvation Front threatens to sweep into power. Then the *Pouvoir* cancels elections.

Real darkness settles in, a decade of it. [...]

The killers are many and generous. They massacre for any reason, even on one another's behalf. The Islamic Salvation Front, the Islamic Salvation Army, the Armed Islamic Group, the Islamic Armed Movement, the National Democratic Rally, the Salafist Group for Preaching and Combat: new chapters by the week. Devout versus secular, traditionalist versus Western, Arab versus Kabyle... Whole villages disappear under cover of dark. Neighbors kill neighbors over old scores, then trick out the corpse to make it political. A corpse can be ordered for a handful of dinars. [...]

68 Cf. Testas' "The Roots of Algeria's Religious and Ethnic Violence." *Studies in Conflict and Terrorism*, 2002, pp. 161–183. See also "Algeria, by Force of Islam." BBC Assignment Series, 1991. <https://www.youtube.com/watch?v=vm05XauePOc>.

The girl's own parents—the last cosmopolitan Algerians not on a boat somewhere—resolve to leave when the death toll reaches eighty thousand. Then they say ninety. Then one hundred. They're still there when the deaths hit one thousand a week. They are the victims of congenital hope. They can't break themselves of that old habit—faith. Not religious faith, which they long ago consigned to the realm of vicious myth. Faith in their friends and neighbors. Belief in the average human. (31; [*my omissions*])

The clash of groups of the same nation, religion, or culture announces the irony and futility of conflicts. It testifies to the fact that wars are the failure of civilizations. When supposedly unified groups still find grounds for war, humanity is stripped of any excuses for war. In this respect, difference also becomes a camouflage reason for disputes. Powers' novel reveals that one can blame technology, religion, civilizational differences—yet nonetheless, all emerge as camouflage reasons. None of these are the real foundation for conflicts. Thus is the state of the world until today: “Postwar,” “Prewar,” “Midwar, now and always.” And again “[t]he killers are many and generous” and “massacre for any reason, even on one another's behalf,” as it is put in *Generosity* (31).

What theory of civilizational clashes applies when “neighbors kill neighbors”? Give war a reason, give terrorism an identity, and war and terrorism become righteous. Thus is the danger of media, thinkers, and politicians confirming an identity to clashes and wars, confirming a well-established self-explanatory reason for civilizational divide such as: “the West and the rest” or “the West and the non-West” or the “Islamic world” versus the “non-Islamic world,” as Huntington justified long time ago and terrorists and the alt-right presume until now. For, thus, war becomes the new religious, ethnic, or civilizational established ritual. As if war was a pillar of piety—the new sacrificial gift to the Gods to approach heaven. All reasons for such atrocities, on the contrary, have to be obliterated. They have to be uprooted from any righteous pious pretensions of social and/or divine good, be it terrorism based on Islamist fundamentalism, white supremacism, clashes based on some civilizational demarcations, or the survival of the fittest. One cannot turn a blind eye to the crisis of current religious and civilizational discourses.

A close critical reading of the discourses of terrorists and war advocates is needed to establish an efficient counter-discourse. Otherwise, hate speech and justified aggression resonate and become the status quo.

Clashes at the micro-level of civilizations are equally captured by *Plowing the Dark*. The Lebanese movie, ‘Where Do We Go Now?’ (وهلا لوين؟/ *Et maintenant on va où?*), directed by the film maker Nadine Labaki, also treats the topic of hope for maintaining peace, mixing it with the bitterness and absurdity of conflicts. The movie starts with a peaceful Lebanese village, where Muslims and Christians live in harmony together. They help build their community away from conflicts until trivial disputes fuel aggression. The disputes result in the killing of some members of each group, under the painful resistance of the majority to maintain unity over individual interests and polarizations. In this light, *Plowing the Dark* hints at the civil war in Lebanon (1975–1990), pinpointing even more bitterness. The following passage captures Taimur’s thoughts on the multifaceted discord in Lebanon in that period: “Each day that passes leaves you confused about this stew, let alone the recipe that produced it. You understand Shiite versus Sunni, Maronite versus Orthodox, Druze, Palestinian, Phalangist, AMAL, the radical Party of God and their fanatical cell the Holy Warriors. But the fourteen other religions and splinter factions plunge you into the same despair that your students feel when confronting irregular English verbs” (*Plowing the Dark* 46–47). The example of the Lebanese Civil War, in the novel, stands for the complexity of conflicts, debunking again the basis of Huntington’s clash of civilizations.

4.2 Neighboring Countries

“Neighbors kill neighbors” (*Generosity* 31) becomes also neighboring countries killing neighboring countries in *Plowing the Dark*. This is marked by the hints at the Iran–Iraq War and Iraq’s attack on Kuwait in August 1990,⁶⁹ leading to the Persian Gulf War, that involved neighboring countries among the 34 countries taking part in the war against Iraq—“a miniature world war,” as Paul Virilio calls it (*Virilio Live*:

69 See also Richard Alan Schwartz, *Encyclopedia of the Persian Gulf War* (165).

Selected Interviews). Huntington, however, takes the example of the first Gulf War as only an exception. The question that here arises is how many exceptions are needed to show that Huntington's rigid civilizational demarcation is erroneous. In Powers' novels, hybrid identities, immigrants, as well as the different war and conflict scenarios stress the porous aspect of civilizations. Huntington argues that "[c]ivilizations are nonetheless meaningful entities, and while the lines between them are seldom sharp, they are real" (Huntington, "The Clash" 3). He carries on, "differences among civilizations are not only real; they are basic" (4). What Huntington calls, "evolution of clashes," is but the regression of civilizations (1–2). Normalizing civilizational wars as "basic," and attributing the aspect of "evolution" to them is a trigger to reversion to mutual hatred and killing, enacted in circles of a void loop.

Huntington indeed stresses that "[d]ifferences do not necessarily mean conflict, and conflict does not necessarily mean violence" (4).⁷⁰ However, religion according to him remains the catalyst of major violence and the identity hardest to navigate (5). He states that "even more than ethnicity, religion discriminates sharply and exclusively among people. A person can be half-French and half-Arab and simultaneously even a citizen of two countries. It is more difficult to be half-Catholic and half-Muslim" (5). In this respect, *Plowing the Dark's* character, Taimur Martin, falls under the category that Huntington considers the hardest to co-exist in one identity: he is half-American and half-Iranian (half-Muslim). This significant choice of hybrid identity, in the novel, signals the variation of variations—the hybrid of hybridity: "an offbeat breed" that always tells a story (*Plowing the Dark* 234). Taimur's identity challenges Huntington's views. It announces an emblem of possibilities—the billion potential configurations of individual singularity and coexistence. In the same way, war scenarios are multiple, coexistence scenarios are multiple—as seen in *Plowing the Dark's* immigrant characters. Unlike Huntington's claims, this stresses that, for humans to evolve, the coexistence of variations has to be cherished and protected in restraint from war.

70 Samuel P. Huntington, "The Clash of Civilizations?" (1993). *The Clash of Civilizations? The Debate* (1996). 1–25.

Based on Powers' novels (and drawing on personal experience), Huntington's re-grouping of civilizations into "Western, Confucian, Japanese, Islamic, Hindu, Slavic-Orthodox, Latin American, and possibly African civilizations" ("The Clash" 3) is fallacious in that there is no such thing as a homogenous Islamic or African world, for instance. There are different and multiple combinations, principles, cultures, complex identities, historical heritage, layers of civilizations, and origins for each and every "Islamic" or African country, which are themselves heterogeneous, the same way the West is diverse, and the Confucianist world is not uniform—as Liu Binyan explains in his response "Civilization Grafting: No Culture is an Island." Grouping and dividing is not enough of a reason for conflicts, for categorizations based on cultural, religious, or civilizational divide are human made. Reasons behind conflicts mainly shed light on the failure of civilizations to co-exist and to negotiate. In many cases, although they harbor religious conflicts, they harbor as a major catalyst individual interests, fighting over power, territories, and/or control of natural resources.

Neither peace nor war is basic within and outside the pseudo-civilizational demarcations that Huntington ascribes. Binyan takes the example of the post-cold war conflicts between Taiwan and China, and he stresses that Confucianism is not enough to bridge what he claims to be "the differences in political systems, ideology and economic development" (Binyan, "Island" 47). Binyan claims that the ailment is dehumanization, made clear in lust for power and money as seen in China, and that a similar "moral and spiritual" vacuum is affecting all civilizations; rather, he calls for "enriching the human spirit" and bringing together of the best of all civilizations instead of highlighting their differences (48–49). For him, "interaction and consensus" could bring civilizations together and eradicate "dehumanization" (49).

In *Plowing the Dark* and *Generosity: An Enhancement*, the rise of extremist groups, violent movements as well as arrogant leaders, constitutes the basis for hate, conflicts, and wars. *Plowing the Dark* highlights speculations on the oil crisis but underlines further factors paving the way for possible unrest: "What about all the unknowns? Political upheavals. Crazy heads of state. Grassroots revolutions. Technological breakthroughs..." (*Plowing* 339). Therefore, conflicts do not burst nat-

urally and innocently out of civilizational determinism. They are promoted by intentions of extremist and corrupt leaders, groups, or movements plus a belief in superiority and/or in a pure civilization, race, or religion—all mixed with interest in power. Their motto is aggression disguised in a civilization, a culture, a religion, or any possible differences and similarities, used to unite or divide. In this respect, civilizational demarcations are human made, ready to manipulate and deploy to build allies, fabricate enemies, or justify wars.

As seen in the aforementioned examples, a nation is already a succession of civilizations, which makes each nation unique due to its hybrid mosaic past. There could be matching sovereign states today, but they never fit perfectly in harmony. Each civilizational classification offered by Huntington bears crossing features and conflicting elements within the “same” and the “different” categories that he confidently demarcates. In “The Summoning: ‘But They Said, We Will Not Harken,’” Fouad Ajami attacks Huntington’s over-simplification of civilizations and argues that “[f]urrows run across whole civilizations, across individuals themselves—that was modernity’s verdict. But Huntington looks past all that. The crooked and meandering alleyways of the world are straightened out. With a sharp pencil and a steady hand Huntington marks out where one civilization ends and the wilderness of ‘the other’ begins” (“The Summoning” 27). Ajami argues that the States control civilizations and not the other way around and, therefore, he claims that national interests are the reason behind conflicts. Respectively, like Borges’ map, Huntington’s categorization of civilizations seems to be a “simulacrum” (to use Jean Baudrillard’s example and concept in *Simulacres et Simulation*). Beyond the civilizational classification that Huntington illustrates, there is potential peace and potential conflict in every zone.

Again, unlike Huntington, Jeanne Jordan Kirkpatrick holds in her response “The Modernizing Imperative: Tradition and Change” that the most violent clashes are within the same civilizations. She states that “[i]t is also not clear that over the centuries differences between civilizations have led to the longest and most violent conflicts: Stalin’s purges, Pol Pot’s genocide, the Nazi holocaust and World War II” (“Modernizing” 51). She continues that “Once aggression had occurred, the United

States and other Western governments became involved for geopolitical reasons that transcended cultural differences; Saddam Hussein would like the World to believe otherwise” (51). Kirkpatrick makes also a point against the clash-of-civilizations theory by reminding the reader that Saddam Hussein was then “the leader of a revolutionary secular regime,” and she stresses that Muslims are usually the first victims of terrorist Islamist groups (51).

As seen equally in *Plowing the Dark*, religious and national identities are (ab)used to manipulate public opinion and to turn conflict into national and spiritual pride. The passage reads as follows:

“Baghdad was lit up like a Christmas tree,” one pilot explained to the camera; “It was tremendous!”

“It looked like the Fourth of July down there,” another boy said. “Just like in the movies.” (*Plowing the Dark* 394)

On such a note, *Plowing the Dark*—as well as *Generosity* as seen in the previous examples—warns against the pitfalls of civilizational manipulation through identity determinism and demarcations of basic violence. In the two novels, the complexity of such delineations is illustrated through manifold examples of diverse combinations of conflicts in groups of the same religion, nationality, ethnicity, and beyond. These expose all along the importance of variations and reciprocity instead of a deterministic violent identity. The next chapter, therefore, focuses on *Plowing the Dark* and explores in depth a more global stance of regression despite progress in the virtuality of war.

Chapter 5 The Virtuality of War

5.1 The Spectacular

The virtuality of war and hostage taking are paralleled in the two major narrative plots in *Plowing the Dark*. In the narrative plot in Seattle, the virtual environment—thought of as an artistic and an advanced entertaining IT project—turns out to possibly be part of military warfare, deployed by the US air force in the first Gulf War. In the parallel narrative line in Beirut, Taimur Martin is captured and taken as a hostage by the terrorist group that is possibly connected to “the group that brought down the American embassy like a stack of mah-jong tiles” (*Plowing the Dark* 151)—maybe in Beirut in 1984. The reference also reminds us of Iran hostage crisis following the attack on the US Embassy in Tehran in 1979 (see *Plowing the Dark* 100–101; 151) and of Saddam Hussein’s manipulation via hostage broadcasting. These instances beget the Gulf War dimensions of virtuality that transform power branding. At the same time, they show that the minute attacks or war are opted for, regression is enacted—even when the most advanced technologies and munitions are put in place. Thus, the war as presented in *Plowing the Dark* is “hyper-real” in the Baudriardian sense; it is self-reflexive, post-World War III that never happened, and virtual; it is interested in its own spectacular smart weaponry as well as promotional “live” broadcasting. The same is true for the hostage crisis, in which Taimur finds himself ensnared.

Adie Klarpol’s participation in the virtual reality environment without knowing about its use for military weaponry stresses a sense of a trap in the ambush between opposing forces. Here, technology and art merge, metamorphosing into smart weaponry. Analogously, Taimur Martin is held hostage by a terrorist group in Beirut with no clarifications. He is left to mental torture within the game of terrorism and warfare, where the virtual and real spaces enact one another. Taimur appears devoid of all human basic rights: he is kept blindfolded and chained in total isolation and without access to a water closet or proper food. Having reached rock bottom, he undergoes debilitating feelings

of inertia: “You haven’t even the will to remove your blindfold. You lie fetal, curled up in your own placenta. Survival is no longer a virtue, given where survival leaves you. On the far side of this nothingness lies more nothing, one continuous void extending to the ends of space, all the way to the vanishing point, where all lines fall into themselves” (*Plowing the Dark* 253).

In war and terrorism, the human becomes a disposable commodity, ready to trash down in the dumpster of war in a duality of mass consumption and mass destruction of human lives. The human in war is “waste” (*déchet*), as s/he becomes a target of annihilation (as Baudrillard explains). In his book *La guerre du Golfe n’a pas eu lieu* (“*The Gulf War: Is it Really Taking Place?*”), Baudrillard argues that:⁷¹

C’est une guerre d’excédents (de moyens, de matériel, etc.), une guerre de délestage, de purge des stocks, de déploiement expérimental, de liquidation et de solde, avec présentation des futures gammes d’armement. Guerre de sociétés excédentaires pléthoriques, suréquipées (L’Irak aussi), vouées au déchet (y compris le déchet humain) et à la nécessité de s’en débarrasser. [...] ainsi les déchets technologiques alimentent l’enfer de la guerre. Ce sont les déchets qui incarnent la violence secrète de cette société – défécation incoercible et non dégradable. Les fameux surplus américains de la deuxième guerre mondiale, qui nous apparaissaient comme un luxe, sont devenus un fardeau mondial asphyxiant, et la guerre elle-même, dans cette fonction de purge et de dépense, tourne bien en deçà de ses possibilités. (*La guerre* 25–26)

71 Jean Baudrillard, “The Gulf War Did Not Take Place.” *La guerre du Golfe n’a pas eu Lieu*. [Translated by Paul Patton, *The Gulf War: Is it Really Taking Place?*]. In *Virilio Live: Selected Interviews*, Paul Virilio expresses his disagreement with Baudrillard. He states that the Persian Gulf War did indeed take place, and he elaborates that “it took place in a small geographical area” while deploying “all the power normally reserved for global war” (n.p.). For him the difference is that “war now takes place in ‘aero-electromagnetic space’” (n.p.). I believe that Baudrillard and Virilio have much more in common in their perception of the war, which resides in this exact sense of hyperreal non-war or “inertia” (Baudrillard, *La guerre* 15, 20–21; *Virilio Live*). Of course, the Persian Gulf War did take place. It is real-time imaging, real-time broadcasting, smart bombs, and remote-controlled vehicles that give it this stance of “non-war” in the sense of hyperreality.

“It is a war of excess (of means, of material, etc.), a war of shedding or purging stocks, of experimental deployment, of liquidation and firesale, along with the display of future ranges of weaponry. A war between excessive, superabundant and over-equipped societies (Iraq included), committed both to waste (including human waste) and the necessity of getting rid of it. Just as the waste of time nourishes the hell of leisure, so technological wastes nourish the hell of war. Wastes which incarnate the secret violence of the society, uncoerced and non-degradable defecation. The renowned American stocks of WWII surplus, which appeared to us as luxury, have become a suffocating global burden, and war functions well within its possibilities in this role of purgative and expenditure.” (“The Gulf War” 103)

The Persian Gulf War is not present in the classical sense of war novels in *Plowing the Dark*. It lies in the margins, haunting the setting and emerging only virtually towards the end. The narrative relates a Baudrillardian sense of the operation in its hyper-real (virtual) features through technology and the hostage as opposed to the soldier. Baudrillard states that *“Nous ne sommes plus dans une logique du passage du virtuel à l’actuel, mais dans une logique hyperréaliste de dissuasion du réel par le virtuel”* (*La guerre* 15); (“We are no longer in the logic of passing from the virtual to the real, rather in the hyperrealist logic of dissuading the real by the virtual” [*my translation*]). Baudrillard carries on in his logic of the non-war (*“la non-guerre”*), where the hostage becomes a means of blackmailing and a tool of dissuasion in the form of a gift or exchange value; and where the world becomes hostage to intoxicating live broadcasting:

La non-guerre se caractérise par cette forme dégénérée de la guerre que sont la manipulation et la négociation des otages. L’otage et le chantage sont les produits les plus purs de la dissuasion. L’otage a pris la place du guerrier. Il est devenu l’acteur principal, le protagoniste du simulacre, ou plutôt, dans son inaction pure, le protagonisant de la non-guerre. Les guerriers s’ensevelissent dans le désert, seuls les otages occupent la scène, y compris nous tous comme otages de l’information sur la scène mondiale des media. L’otage est l’acteur fantôme, le figurant qui occupe l’espace impuissant de la guerre. Aujourd’hui, c’est l’otage sur site stra-

tégique, demain l'otage comme cadeau de Noël, l'otage comme valeur d'échange et comme liquidité. Dégradation fantastique de ce qui était la figure même de l'échange impossible. [...] Et nous tous, otages de l'intoxication des media, induits à croire à la guerre [...] assignés au simulacre de la guerre comme à résidence, nous sommes déjà tous, in situ, otages stratégiques, notre site, c'est l'écran, ou nous sommes jour pour jour virtuellement bombardés, tout en savant aussi de valeur d'échange [...] (*La guerre* 11–12)

“The non-war is characterized by this exact degenerate form of warfare, which is marked by the manipulation and negotiation of hostages. Hostage and blackmail constitute dissuasion’s purest commodity. The hostage has substituted the warrior. He has become the predominant agent—the protagonist of the simulacrum—or rather, in his pure inertia, the protagonist of the non-war. The warriors bury themselves in the desert; only the hostages take the stage, including all of us as hostages to the news of world media. The hostage is a phantom agent. He is a background actor, who fills the impotent space of war—being, today, the hostage on a strategic site; and becoming, tomorrow, the hostage as a Christmas present, the hostage as an exchange value and as cash flow. It is a fantastic deterioration of what has been the very essence of impossible exchange. [...] And all of us, hostages of media intoxication, are led to believe in war [...] placed under the simulacrum of war just like under house arrest, we are already all, in situ, strategic hostages. The screen becomes our space, where we are virtually bombarded, while being part of the exchange value [...]” [My translation]

Indeed, “real time” reporting from the battlefield made its debut in the Persian Gulf War.⁷² Therefore, Adie and her partner (Steve) appear in the novel as prisoners of the news: they “stared nightly at a mute set, from under their bedcovers, forced to watch the upshot of everything they’d put their hand to,” and by means of media coverage, “violence seemed to expend even its viewers as collateral damage” (*Plowing the Dark* 395). This, in turn, fits exactly Baudrillard’s metaphor of the

72 Also, Cable News Networks (CNN) ensured “virtually continuous coverage” of the war with “unprecedented” positioning of journalists in the enemy territory for live reporting (*Encyclopedia of the Persian Gulf War* 105).

civilians being hostage to the intoxicating news of international media during the war.

Jean Baudrillard also brand names the broadcast of hostages by Iraq, and the deployment of advanced technologies by the United State, as advertisement. For him, “Saddam Hussein” is thereby granted “an unforgettable and charismatic label” (“*un label charismatique inoubliable*”), and the United States is ensured “an unequalled technological label” (“*un label technologique sans égal*”)—independently of victory or defeat.⁷³ Baudrillard explains that through such “promotional advantages” that are made fantastic on parade (“*le bénéfice publicitaire en est fantastique*”), “the sumptuary expenditure in material is already equivalent to that of a real war, even if it has not taken place” (“*la dépense somptuaire en matériel est déjà l'équivalent de celle d'une guerre réelle, même si elle n'a pas lieu*”) (*La guerre* 20–21 [*The Gulf War* 101]).⁷⁴

In such a scenario, the reality and virtuality of war interweave the “spectacular” with the despicable to give it the illusion of progress and grandiose stance. The war is here obsessed with its epic appeal: “am I spectacular enough, am I sophisticated enough to make an entry onto the historical stage?” (“*suis-je assez spectaculaire, suis-je assez sophistiquée pour entrer historiquement en scène?*”) (*La guerre* 23; [*The Gulf War* 102]). In such self-reflexivity, the hostage is deployed as a devalued advertised commodity: “transformed into marketing ploys, and in the absence of any clarification of plans, balance sheets, losses or operations” (“*devenus arguments de vente publicitaire, sans que soient éclaircis ni les plans, ni les bilans, ni les pertes, ni les opérations*”) (*La guerre* 20; [*The Gulf War* 101]). Therefore, being advertised, the hostage adds a twisted virtual dimension to a war that makes use of virtual technology, stepping down into the abyss of *voyeurism* and showing off. The war, thus, appears as self-aggrandizing in the sense of publicity logic due to the mutual rivalry media war (*La guerre* 22) and to virtual technology integrated in smart bombs. This is equally the case in *Plowing the Dark*.

73 Jean Baudrillard, “The Gulf War Did Not Take Place.” *La guerre du golfe n'a pas eu Lieu*, pp. 20–21 [Trans. Paul Patton, *The Gulf War: Is it Really Taking Place?* Pp. 101].

74 Again, the Persian Gulf War did take place. It is real-time imaging, real-time broadcasting, smart bombs, and remote-controlled vehicles that give it a stance of “non-war” in the sense of hyperreality.

5.2 Smart and Precise

The whole planet descended into the flicker of shared delirium. [...] The Northern hemisphere embarked on a winter of perpetual broadcast. On signal, by mass, silent agreement, an unbroken umbrella of full coverage stitched itself together.

[...] Downhill from the labs, gas stations and delis inundated her [Adie] for free—aerial bombardment [...] She stopped eating. She began to throw up [...]

Smart bombs beamed back video to even smarter bombers. Nosecone shots documented their descents all the way up to the moment of deliverance. One missile steered itself down the midline of a twenty-foot-wide bridge. Another threaded the chimney of a suspected command-and-control center. Laser beams guided their cruise payloads for hundreds of miles over the wrinkled earth to land on a square smaller than the Cavern's front wall.

[...] The race had achieved the precision of its earliest dreams. [...] People died without a sound, bloodless, thousands of feet below the all-seeing eye. (*Plowing the Dark* 394; [*my omissions, my additions*])

“Live streaming” footage (from smart bomb cameras for the public to watch) double the effect of exhibitionism and *voyeurism*. This emerges through penetrative perception, as seen in the passage above and as captured by Michael Taussig. According to Taussig, the elements of sensuous perception in the mimetic faculty, copy and contact, refer to destructive contact in the case of mobile technological means of mimesis like the camera when attached to bombs, enabling the mobility of perception (Taussig, *Mimesis and Alterity* 27).⁷⁵ Here, Taussig gives the example of the first Gulf War: “‘It almost makes you seasick,’ comments the Lieutenant Colonel in the United States Air Force as, with quiet pride two days into the Persian Gulf War in 1991, he queasily displays

⁷⁵ On the mobility of vision through the flying camera, Taussig also refers here to Paul Virilio, Nam June Paik, and Dziga Vertov (27).

for US television news a prolonged video shot taken by one of his precision bombs seeking its target, gliding in a soft wavy motion through the Iraqi sky” (Taussig, *Mimesis and Alterity* 27).

The “extraordinary” capacities of smart weaponry revolve around the triangle of *virtuality*–*mobile perception*–and *precision*. Silent, black and white footage of the smart-bomb cameras were supposed to make of war reporting a “sanitized” intervention.⁷⁶ The war hence becomes equated to surgical interventions. Whereas a surgery’s purpose is clear in rescuing lives, even if there is a risk of death when not successful, the purpose of war described as clinical becomes blurred as it implies rescue in the first place, although death tolls are the first outcome. At the same time, the officer, who was supposedly handling the video-controlled bomb and looking at the target in the cross-hair, was depicted as “the luckiest man in Iraq.”⁷⁷ It is in such virtuality that the Persian Gulf War gained the reputation of video gaming. While watching someone else playing at the joystick, each member of the audience of a computer game awaits their turn impatiently to get the chance to play. Therefore, the expression, “the luckiest man,” connotes a peep into a realm of a supposedly “exciting” virtuality of war, in a video-gaming understanding of the word. Hence war—in the Gulf War sense as depicted in *Plowing the Dark*—reveals an irony of “safe adventure,” “sanitized,” and “remote controlled” via “laser beams.” It is depicted as “infrared,” and stealthy, in the desert, using gadgets such as satellite maps, radar, and infrared reconnaissance of the camouflaged and non-visible (*Plowing the Dark* 394–395; *Encyclopedia* 164, 167, 171). These aspects, as portrayed in the novel, offer a critique to romanticizing the virtuality of war.

The weaponry mentioned in the previous passage captures well the advanced smart weaponry that marked the first Gulf War. Smart bombs indeed made their debut then (*Encyclopedia* 167). The weaponry

⁷⁶ The omission of any images or data on the death toll in media coverage was intended to counter-balance the bloody scene of the Vietnam War (*Encyclopedia* 106).

⁷⁷ As General Norman Schwarzkopf proudly announced during the press-conference briefing on the operation of the Persian Gulf War, held on January 30, 1991 (“U.S. CENTCOM” 12:00–12:45; Thompson, “Stormin’ Norman”). This instance may be referenced in *Plowing the Dark* by the following extract: “Joint chiefs gave press conferences, explaining their multimedia clips in careful play-by-plays. A riveted Realization Lab turned as long and obscure as its means were swift and expedient” (*Plowing the Dark* 395).

was thus not simply the burden of excess from World War II, recycled for the use in the Gulf War, as Baudrillard puts it. Operation Desert Storm staged the introduction of all sorts of smart bombs: laser-beam guided, infrared self-guided, and video-guided ones (167–169). Other smart weaponry was equally used for the first time, namely, Pioneer RPV (Remote Piloted Vehicles), which are remote-controlled reconnaissance propeller planes equipped with video cameras for daylight and infrared cameras for the night. Another example is the new Joint Surveillance Target Attack Radar System (E-8 JSTARS).⁷⁸ These could capture “wide-angle views of a 500 square kilometer area or detailed views of 20 square kilometers” (*Encyclopedia* 165). The system was equipped with “display monitors on board of the plane,” but additionally enabled data broadcast in real time to up to “15 Army units on the ground” (165). These granted “field commanders the ability to view mechanized forces in real time” “for the first time in history” (165). Another new technology included the F-117A Stealth Fighters, which were hard to expose by radio wave systems, and impossible to hear (167). Besides, they were equipped with direct laser-guided bombs, and were fitted to carry out heavy bombing missions in all weather conditions as well as at night (167). Because of their sneaky nocturnal capacities, the Stealth Fighters were also called “Nighthawks” (167).

Pioneering usage of satellite technology in the first Gulf War also enabled allied combat executives and troops to plan in real time and to act dependently on dynamically shifting events on the battleground. Therefore, they made use of data from “weather satellites” and “multi-spectral imagery satellites” to create “updated maps” of the area, which also allowed them to “track Iraqi troops” (171). Thereby, even non-visible objects, such as “camouflaged vehicles in the desert,” could be detected via infrared radiation (171). Simultaneously, the introduction of the Global Positioning System (GPS) enabled the soldiers to self-position in the desert; furthermore, the desert missions were enhanced with hand-held GPS (171). Hence, the list of satellite systems provided the Persian Gulf War unprecedented access to “extensive, coordinated use of space

78 The JSTARS are Boeing 707s equipped with sophisticated radar systems, as described above (*Encyclopedia* 165).

technology” (171). This in turn created high connectivity with simultaneous data sharing between different allied troops and vehicles.

Plowing the Dark brings to the fore the smart and precise weaponry and the use of space technology. The passage reads with vivid accuracy, reflecting the spooky scenes of “intelligent” battlefields:

Babylon became a bitmap. Pilots took its sand grains apart, pixel by pixel, their soldier bodies tied to weapons systems by electronic umbilical, their every joystick twitch duplicating moves overlearned in years of now-consummated simulation. Nightscopes revealed minute movements, at impossible distances, in pitch-dark. Robot stalkers chased living targets. Formal edge-detecting algorithms told heat from cold, friend from enemy, camouflaged caches from empty countryside. Human intelligence migrated wholesale into its artifacts.

It was the perfect operation: the kind you carried out deep in enemy territory. It told no story, finally, aside from these abject images. [...]

We did this? She [Adie] whispered to him. *It's us?*

[...]

The bombs with depth perception? The ones that can tell our vehicles' silhouettes from the Iraqis'? The cruise missiles with a whole digital map of the world inside them, so that they know exactly where to explode?

[...] *What have we been doing here? Are they using the same electronics as us? Are they taking our code?*

He [Stevie] smiled at her near-total naïveté. *The military? The Air Force invented virtual reality half a century ago. Mission trainers, flight simulators. The Army made the first computer, back when the game was still about beating the Nazis. They've been hip-deep into VR from the beginning. ARPA built the Net. They ordered the first microprocessor. You sow the Whirlwind, you reap SAGE. He went on, numbly, dull. On automatic pilot. If you want to know the truth, we're stealing their code. The whole runaway century, living off military spin-offs. (Plowing the Dark 395–396; [my omissions, my additions])*

The episodes in the novel that depict the war scenes draw exactly on the hyperreal stance of an operation—incubated in simulations and flight simulators. Once enacted, it functions through an overload of smart weapons, where the “bodies” are attached electronically to a whole system of weaponry and are enhanced by machine vision and decisions. Here, heat becomes a faithful signal, and darkness hinders neither perception nor precision. Hyperreality reaches a peak, as depicted in the narrator’s ironic statement: “Human intelligence migrated wholesale into its artifacts” (395). However, total trust in pseudo-precision and artificially smart systems is not flawless.

Along with the satellite maps, video-guided bombs render a total verticalization of space, omitting any sense of distinction between the different layers of space. In her essay “In Free Fall: A Thought Experiment on Vertical Perspective,” Hito Steyerl condemns the total verticalization of space and the excess of precision; she deems them as means that kill mapping (6–8). In *Cartographies of the Absolute*, Alberto Toscano and Jeff Kinkle also stress that “the map will hinder the mapping, as we come to be captivated by fetishes of scale and precision that smooth over the world’s contradictions” (4). With this statement, Toscano and Kinkle refer to Steyerl’s notion of “free fall”: “views which allow the vertical zoom to distract us from—or to punitively distort—a condition of ‘free fall’, in which neither our aesthetic devices nor our political strategies can comfort themselves with a ‘single unified horizon’” (*Cartographies* 4). Toscano and Kinkle, therefore, question the reliability of “technologies like the GPS and Google maps” in understanding the “social world” with a vision of the world “as seamless continuum,” in which these technologies “prove a remarkably unreliable guide for military and commercial expediency” (4). Steyerl explains that

The view from above is a perfect metonymy for a more general verticalization of class relations in the context of an intensified class war from above—seen through the lenses and on the screens of military, entertainment, and information industries. It is a proxy perspective that projects delusions of stability, safety, and extreme mastery onto a backdrop of expanded 3D sovereignty. But if the new views from above recreate societies as free-falling urban abysses and splintered terrains of occu-

patation, surveilled aerially and policed biopolitically, they may also—as linear perspective did—carry the seeds of their own demise within them. (“In Free Fall” 8)

As seen in *Plowing the Dark*, the pilots/soldiers rely heavily on camera vision and heat detection in the cases of the camera-guided bombs and infrared-guided bombs, respectively. However, camera vision reveals multiple challenges. To draw on Cruz-Neira’s study these are a distortion of objects and angles, a lack in visual acuity, a limited field of view, a lag created in real-time representation, and intrusion that isolates the viewer from “the real environment” (Cruz-Neira, “The CAVE” 68–69). Heat detection highlights equal problems. By detecting only heat in infrared-guided bombs, there is a total effacement of the body as it only detects heat emitting vehicles. There is no possible way to know who exactly is in the vehicle; children or innocent people. Actually, infrared-guided bombs mistook many of the heat-creating entities—like already bombed space that was burning—for enemy vehicles, making bombing a double measurement of excess (Schwartz, *Encyclopedia* 169).

5.3 Blackmail and Shock

In the case of terrorism, dimensions of exhibitionism and the virtual function through shock are created in despicable ways by the effect of surprise. Terrorists aim at the ugliest ways of killing and showing it. Usually, there is no prior declaration of war in a territory, but rather a post-claim of adopting the deed. Surprise attacks are launched in random public places, full of civilians, or on soldiers without engaging in any conventions. Deployment of surprise and shock constitutes the terror in itself, including hostage taking, the 9/11 attacks, assassinations of soldiers or political figures, as well as assaults on schools, museums, stadiums, malls, hotels, and embassies. Added to this list, suicide bombing amplifies the perversion and purports the message that the terrorist regime values absolutely no human life. Therefore, terrorist groups live in the margins; in hidden or usurped territories. *Plowing the Dark* captures three aspects of terrorism: 1) it reserves a whole major narrative plot to hostage taking with a focus on the captive, Taimur, who is

a civilian English teacher of half-Iranian half-American origins; 2) the novel indirectly hints at the Iran hostage crisis and briefly notes terrorist attacks on American embassies, possibly in Tehran in 1979 and in Beirut in 1984 (*Plowing the Dark*, 100–101; 151); and 3) it lists various names of extremist groups as Taimur tries to guess the identity of the unit responsible for his confinement. *Generosity* also tackles terrorism at the narrative background (see chapter 4); and *The Echo Maker* is situated in a post-9/11 context, and it hints very briefly at the assaults. This sub-chapter, however, focuses mostly on the virtuality of terrorism in *Plowing the Dark*.

Plowing the Dark follows the Baudrillardian logic of “non-war,” where, again, instead of soldiers, the hostage becomes the symbol of the war, representing “the protagonist” of absolute “inertia” and “simulacrum.”⁷⁹ It is in this hyperreality, where the terrorist (anarchist and not part of a regulated system) also exists. Claiming to be a defender of religion, or of a God, the terrorist uses human beings as a tool of pseudo-dissuasion. While Taimur is clearly not connected to the war, he is dragged to the scene, highlighting the irony of how terrorists grant themselves full self-righteousness. If not for self-interested blackmailing, the terrorist’s mission becomes heaven at any cost: be that human corpses and terror. Their “self-salvation” in a “promised paradise” is prescribed under their own terms—and for that they make of their own death a weapon (Baudrillard). Here, we do not talk about natural or artificial intelligence anymore, we talk about what Baudrillard calls “*l’intelligence du Mal*” (“the intelligence of evil”) (*Lesprit* 20; [my translation])—or human brain regression at best.

In the spirit of terrorism, in his book *Lesprit du terrorisme*, published post 9/11, Baudrillard stresses how suicide bombing constitutes the core of the terrorist mindset, which becomes their ultimate munition.

Ils [les terroristes] ont réussi à faire de leur propre mort une arme absolue contre une arme absolue contre un système qui vit de l’exclusion de la mort, dont l’idéal est celui zéro mort. Tout système à zéro mort est un

79 Jean Baudrillard, *La guerre du Golfe n’a pas eu lieu* (11–12).

système à somme nulle. Et tous les moyens de dissuasion et de destruction ne peuvent rien contre un ennemi qui a déjà fait de sa mort une arme contre-offensive. [...]

Ainsi donc, ici, tout se joue sur la mort, non seulement par l'irruption brutale de la mort en direct, en temps réel, mais par l'irruption d'une mort bien plus que réelle: symbolique et sacrificielle – c'est-à-dire l'événement absolu et sans appel.

Tel est l'esprit du terrorisme. (Baudrillard, *L'esprit du terrorisme* 24–25)

"[...] *They [the terrorists] have succeeded in turning their own deaths into an absolute weapon against a system that operates on the basis of the exclusion of death, a system whose ideal is an ideal of zero deaths. Every zero-death system is a zero-sum-game system. And all the means of deterrence and destruction can do nothing against an enemy who has already turned his death into a counterstrike weapon [...]*

Here, then, it is all about death, not only about the violent irruption of death in real time—'live', so to speak—but the irruption of a death which is far more than real: a death which is symbolic and sacrificial—that is to say, the absolute, irrevocable event.

This is the spirit of terrorism." (Baudrillard, *The Spirit of Terrorism* 16–17)

They lie, kill, recruit to kill, and kill themselves. They kill on all occasions and at all locations; in airports, on the beach, in schools, on mountains, in buses, big cities, small towns, at the borders, and downtown—blindly and without any compassion or rules. Although Taimur is released after four years of captivity, still his lot is not less devastating. Taimur's being in itself becomes a perpetual mental and psychological death: "one continuous void extending to the ends of space, all the way to the vanishing point" (*Plowing the Dark* 253).

At the top of the hierarchy, leaders adopt hideous titles that imply total submission from their followers such as "our prince" (*Emir-na* أميرنا)—or in the case of *Plowing the Dark*, "master." Revered and feared, these dictate to their followers what to do to go to heaven or hell, and who deserves to die or to live. Hence, they take terrorism as the new

“God.” Baudrillard’s *L’esprit du terrorisme* misreads terrorist attacks as only aimed at the West. It misses the point that terrorism targets all countries and groups. *Plowing the Dark* (along with *Generosity*) remedies such misconception, by giving Taimur a hybrid identity. The formula is simple: for the terrorist, those who are not on their side, and do not follow their leader or join their camp, are then the enemy of “God.” In this logic they become Gods. They decide who goes to heaven and who goes to hell, who to aggress and who to set free. One thing, of which they are arrogantly sure, is that they will end up in heaven (an afterlife as the ultimate reward) for whatever extremist deed they execute, so they give themselves a fast-track ticket to their pre-fabricated Eden.

In their pretentious attempt to “revive” Islam, terrorists bomb, mutilate, and hijack it. They are thus either stupid, *maladroit*, or simply bandit criminals. In their gesture of iconoclasm, they hammer down all pillars and spiritual peacefulness that a religion could strive for, in its moderate forms. Islamist terrorists use the axe of iconoclasm on the same religion they claim to protect and promote. They hit right at its core, and spread cracks all along its surface. What is left is a splintered looking glass in which terrorists see themselves as heroes, and innocent civilians (connected to the Muslim faith) face their despair to distance their image and their singularity from the crime. The distortion amplifies in the face of the media, when generalization becomes the discourse of the real. Thus, media, iconoclastic in its attempt to cover the event, covers *reality* as well, and it does not attempt to discern differences, throwing all individuals into the same basket instead. Institutional laws follow (restraining the freedom of the innocent, who become eternal suspects), and military decisions follow (in bombing a whole country). In the “non-war,” civilians pay for crimes they have not committed, for in such a triangulation point, civilians are sentenced without a court hearing or an appeal. Such is the case of Taimur Martin in *Plowing the Dark*, representing ultimate hyperreal inactivity as hostage. *Plowing the Dark* makes the complex dynamics visible through the hybrid identity of Taimur, being half-American half-Iranian, and through his attempts to debunk the terrorist’s mind, stressing his singularity as an individual.

5.4 The Containment-Contagion Paradox

In his book *Welcome to the Desert of the Real*, Žižek questions the old name of the operation, “infinite justice,” and points out its collateral damage and slippery side effects. He argues that the “war on terror” is interminable and infinite: “this process will be, by definition, endless in the precise sense of Hegelian ‘bad infinity’” (*Welcome to the Desert* 57).⁸⁰

Indeed, the war against terrorism should not turn into a witch hunt that causes damage to the innocent. Powers’ novels (*Plowing the Dark*, *Generosity: An Enhancement*, and *The Echo Maker*) disclose the nomad, minefield infestation of terrorism. The enumeration of various terrorist groups signalizes a virus-like contagion.⁸¹ However, in the paradox of containment, the moment “war on terrorism” is unleashed on one country—or a revolution gets out of hand—new groups of terrorists emerge, inducing contagion and mutation. The major problem is that unstable territories become fragile. Caught up in the loop of eradicating terrorism, collateral measures eradicate countries to ground zero, leaving a void (political) infrastructure ripe for more infestation. Žižek cynically points out that the “coincidence of opposites” culminates in the nomination of “George W. Bush and Tony Blair as candidates for the Nobel Peace Prize” in 2002 (*Welcome to the Desert* 94). Along with the Baudrillardian sense of the hyperreal war, *Plowing the Dark* exemplifies the Žižekian interpretation: “the old Orwellian motto ‘War is Peace’ finally becomes reality” (*Welcome to the Desert* 94).⁸² During the International March against Terrorism in Tunisia (2015), the late Tunisian president Beji Caid Essebsi insisted that we are all in a war against terrorism and for this reason we should all come together (Amara, “Marche”). Terrorists would win the war if the gap between “the West” and the “Muslim” world keeps widening. Isolated, each country becomes a fragile target.

⁸⁰ In *Welcome to the Desert of the Real*, Žižek draws attention to the dangers behind the discourse of war, where all means become justified (57).

⁸¹ In *The Spirit of Terrorism*, Baudrillard points out the virulent aspect of terrorism, stating that it is indeed everywhere (10).

⁸² Baudrillard also refers to the Orwellian paradox in his book *Simulacra and Simulation* to describe modern “pacification” in a communist/capitalist context (*Simulacra* 38).

5.5 Antiaesthetic

By attaching to war and terrorism a heroic and epic stance, both terrorists and proponents of war create an aesthetics of killing, where the human is waste. In the epilogue of “The Work of Art in the Age of Mechanical Reproduction,” Walter Benjamin advances that “[t]he logical result of fascism is the introduction of aesthetics into political life” and that “all efforts to render politics aesthetic culminate in one thing: war” (119). He quotes Marinetti’s manifesto on the Ethiopian colonial war:

For Twenty-seven years we Futurists have rebelled against the branding of war as antiaesthetic... Accordingly we state: ... War is beautiful because it establishes man’s dominion over the subjugated machinery by means of gas masks, terrifying megaphones, flame towers, and small tanks. War is beautiful because it initiates the dreamt-of metallization of the human body. War is beautiful because it enriches a flowering meadow with the fiery orchids of machine guns. War is beautiful because it combines the gun fire, the cannonades, the cease-fire, the scents and the stench of putrefaction into a symphony. War is beautiful because it creates new architecture, like that of the big tanks, the geometrical formation flights, the smoke spirals from burning villages, and many others... Poets and artists of Futurism!... remember these principles of an aesthetics of war so that your struggle for a new literature and a new graphic art... may be illuminated by them! (qtd. in Benjamin, “Mechanical” 119–120)

In contrast, *Plowing the Dark* does not celebrate an aesthetics of war. Adie, who was originally a painter and who joined the virtual reality (VR) Cavern in Seattle, ignoring the weaponry aspect of the project, torments herself: “All I wanted to do was make something beautiful. Something that wouldn’t hurt anyone” (*Plowing* 397). Indeed, the spectacular dimension becomes breathtaking in the literal sense for Adie once exposed to the “intoxicating” live footage (*Plowing* 394). Facing the shocking news, she panics even more as she suspects her involvement in constructing the technology deployed in Iraq. Like the hostage Taimur, she also becomes an instrument in the war without previous knowledge or consent. Instead, Adie expresses her craving for an aesthetics of peace.

In this respect, *Plowing the Dark* (along with *Generosity*) manages to create an aesthetics of human life that lies in the pluralistic variations of identities and the act of alterity and contact without destruction.

By depicting the abhorrent ugliness of the World War I battlefield with details of human bodies decay along with the ruins of the city (beyond the screens of TVs, or bomb and jet cameras), Sam Mendes' war movie *1917* portrays a repugnant scenery that is far from "neat and clinical." *Plowing the Dark* is not a war novel, in this respect. Still, it reveals vertical precision in the free-fall smart bomb cameras, which flattens emotions, vision and observation, and which camouflages destruction in black and white silent sequencing: "It was the perfect operation: the kind you carried out deep in enemy territory. It told no story, finally, aside from these abject images" (*Plowing the Dark* 395). In the bombing scenes, *Plowing the Dark* dwells in such silent hyperreal preciseness as the background of Adie's and Taimur's total despair.

In the logic of the abject, the installation, "Can't Help Myself" by Sun Yuan and Peng Yu, exhibited at the Venice Biennale 2019, "May You Live in Interesting Times" captures the sickening ugliness of what could be understood as the machinery of mass killing. The installation is composed of a robotic arm that frantically rotates in all directions, sweeping and splashing blood-like liquid in a "710 × 710 × 500 cm" frame.⁸³ The pictures (Fig. 2) exemplify the installation from various angles.

The machine releases a squeaking noise as it pivots in different directions, on vertical and horizontal axes and, as its title "Can't Help Myself" suggests, the robotic arm does not cease spinning. When the arm freezes, the top silver-colored metal with a rubber border pirouettes on the same spot, in an obsessive-compulsive behavior. The blood floods back surrounding the base; and the robotic arm resumes the hectic cleaning—as if marking some kind of post-traumatic stress. Although the viewer is conscious that the liquid is not blood, the sight of it and the squeak provoke awe, dizziness, and a nauseous feeling. This sickening feeling is portrayed in Adie's reaction to the live footage of the war: "She stopped eating. She began to throw up, at odd hours" (*Plowing the Dark* 394).

83 For a better view of the installation in motion, a video sequence is available online via <https://universes.art/en/venice-biennale/2019/tour-giardini-2/sun-yuan-peng-yu>.



Fig. 2 Sun Yuan and Peng Yu, "Can't Help Myself," Venice Biennale "May You Live in Interesting Times," Giardini Central Exhibition, Venice, 2019 © Sun Yuan & Peng Yu Studio provide

To sum up, *Plowing the Dark* stresses the absurdity of civilizational division through the tropes of the first Gulf War, manifold terrorism, and Taimur's hybrid identity. The same is true in *Generosity: An Enhancement* through the hybrid identity of Thassa and transformational civilizational demarcations; as well as in *The Echo Maker* through Mark's paranoia in the aftermaths of 9/11. Variations and restraint—as well as clashes of groups of the same identity, religion, and nationality—subvert Huntington's rigid civilizational borders. Here, the stress is put on regression despite progress through the spectacular and the virtuality of war, ultimate regression through terrorism and shock, and the dilemma of containment–contagion.

Part II shows that, along with the different modes of artificial evolution, modes of artificial regression persist. This brings out civilizational dynamism in the novels and displays the mix of virtual–real in historical events. This announces as well the next part (III) that focuses on *Plowing the Dark's* narrative structure, exposing other levels of clashes, virtuality, and superimposed strata in the form of artistic evolution. From there, the structural analysis of *Plowing the Dark* will help better fathom the techniques that shape Powers' narratives. The next section, therefore, opens a door into artistic evolution through the interdisciplinary thought exemplified in *Plowing the Dark*.

Part III Artistic Evolution: *Iconoclash* through Interdisciplinary Thought

a. From Iconoclasm to “Iconoclasm”

Part III addresses the artistic evolution present in the novels of Richard Powers, by focusing on *Plowing the Dark*'s narrative structures. The analysis reveals elements of “iconoclasm” in the light of Bruno Latour's definition, where the act of destruction or construction is not clear in purpose, and it transforms the application of the theory into new combinations pertinent to the narrative. The novel's iconoclasm is apparent in the juxtaposition of the literary narrative structures with elements of the virtual reality technology CAVE, the architecture of the Hagia Sophia, and the Qur'anic structures. *Plowing the Dark* tackles the complexity of iconoclasm and iconoclasm through the process of prototyping the Hagia Sophia in the CAVE virtual space. During the process, the novel traces the evolution of art from prehistoric cave paintings, and it projects its future in the virtual space. First, the narrative structures simulate the virtual reality CAVE system. Then, the virtual Hagia Sophia brings the elements of artistic evolution and iconoclasm into the foreground, through perspectives into its interior design and architecture. Finally, elements of iconoclasm intersect through the aesthetic structures of the Qur'an, which Taimur reflects upon in his reading.

Part III, therefore, examines the conflicting elements that constitute the intercultural and interdisciplinary strata of the narrative. By examining *Plowing the Dark*'s narrative make-up closely, the study helps to understand Powers' writing strategies in the four novels and his conception of the novel as a genre within the frame of interdisciplinary choices. Here, the evolution of the narrative surfaces from prehistoric drawings and oral storytelling; it passes through different trends and forms, and it reaches the form of the interdisciplinary novel, which, in itself, is a link in the chain, looping towards the next changes. Apart from theories on the two concepts of “iconoclasm” and “iconoclasm,” more theories are added to the study of the narrative. These theories are pertinent to the CAVE systems as treated by the computer scientist Carolina Cruz-Neira, to Hagia Sophia's interior design by the art historian Bissera V. Pentcheva, and to Islamic studies. They are explained, directly, in the chapters to emphasize the connections to the novel's elements.

For the sake of clarity, part III begins with a brief overview of the historical and theoretical backgrounds, which stem from the Hagia

Sophia's context and rely on Jaś Elsner's and Bruno Latour's theories concerning "iconoclasm" and "iconoclash." The terms are developed throughout the chapters of part III, and—as explained previously—they are additionally used in different combinations that align with the narrative structures of *Plowing the Dark*. In his article "Iconoclasm as Discourse: From Antiquity to Byzantium" (2012), art historian Jaś Elsner—who works on the production and reception of Roman and Early Christian art—offers a *longue durée* study of the discourse of iconoclasm in the Iconoclastic Byzantine eras. Elsner points out that the term "iconoclasm" evokes various meanings. These range from "a set of events" that took place in the Byzantine context to "activity" that resulted in "damage to images and place in human history" ("Iconoclasm as Discourse" 386). In his essay, he deploys the concept of iconoclasm in the sense of "physical attack on images within the Greco-Roman-Byzantine world" (*ibid.*). Therefore, he examines its different manifestations "from archaic antiquity up to and including the period known as the Iconoclastic era in Byzantium" (*ibid.*). By so doing, Elsner traces the origin of iconoclasm discourse back, not only to Byzantine (Eastern Roman) Christology, but also to ancient Greek art and Early Roman politics.

Elsner's art historical study provides a method of "impassé" in evidence instead of "over-explanation," and it focuses on the discourse involving the contradictory reception and cultivation of images ("Iconoclasm as Discourse" 386). These include different trends of iconoclasm and iconophile, which led to rethinking the image and the extent of its representation. As he claims, the focus is on:

[...] how the process of theorizing both iconoclasm and the iconophile response to it enabled a long tradition of thinking about what an image was, a tradition going back deep into pre-Classical Greek antiquity, to come to a clear and conceptual position on the issue of the relation of a visual image to the model or prototype that it imitated through representation. The range of positions on the nature of images offered during Byzantine iconoclasm constitutes a fundamental conceptual contribution to the problem of image as representation as it developed in the Western tradition. (386)

Concerning the problems of the study of so-called Iconoclastic Byzantine, Elsner continues with an emphasis on image construction and destruction. He begs the question of which historical method is more pertinent; a “narrow historical” account that starts in the aftermath of the possible destruction of the Chalke Christ in Constantinople in 726 (730), or an account of “longer term processes” going back to pagan antiquity as well as early Christianity (“Iconoclasm as Discourse” 377; 386).

[...] the conceptual developments of Byzantine iconoclasm—cast as theological arguments in a deep dispute that had numerous entailments in politics, society, and ritual—are the final completion of the process of philosophical thinking about images in the Greco-Roman heritage. What came to matter is that a particular form of image—the icon of Christ—should have been taken (perhaps invented, or deemed necessary) for the job of having been destroyed. The justifications of, recriminations about, and responses to this destruction from all sides in the dispute were in themselves revealing of theoretical positions (explicit or implicit) about representation as well as of changes and developments in such positions at a key point of transition between antiquity and the Middle Ages. (386)

According to Elsner, the practice of “image cultivation” is what gives the image a secondary dimension of “real presence” (“Iconoclasm as Discourse” 370). Image cultivation consists of “all forms of devotion to images, from the uses of kissing, candle lighting, and worship to dressing, framing, covering, and exposing them” (369). Indeed, he stresses that the paradoxical and controversial practices connected to the icon exist in the Judeo-Christian tradition as well as in the Muslim counterpart, and that they are all “inherited from polytheistic antiquity” (*ibid.*). Image controversies of representation persisted in the mimetic analysis of Plato and Aristotle in ancient Greek, and iconoclastic practices were part of “legal sanction in the Roman system” (*ibid.*).

Therefore, according to Elsner, the act of iconoclasm is not related to religious icons and the religious discourse only, but it is also linked to the political discourse and activity dating back to the Middle and Late Republic of Rome. These are apparent in the practice of “memory erasure” or damnation (“Iconoclasm as Discourse” 370). The act

resulted in destruction or disfigurement of statues, or in the demolition of the icons of the preceding rulers as punishment to state foes, adversaries, or followers of former sovereigns (*ibid.*). However, in order for iconoclasm to work as such, traces of the act of ruination have to stay visible, as Elsner highlights: “In the case of the destruction of multiple statues of one individual, it appears that by late antiquity one or two examples were usually allowed to remain; to be effective, the attack on memory had to tolerate exceptions so that the condemnation itself would be remembered” (*ibid.*). On the other hand, antiquarian attitudes have equally involved the reconstruction of history and icon preservation, making Byzantine iconoclasm a process of both “destruction” and “creation” of the image, and, at the same time, making the image a form of “political and ecclesiastical” “propaganda” (“Iconoclasm as Discourse” 373).

Elsner’s study tackles the first and the second Iconoclastic eras, which happened in Constantinople between 726 (730) and 815, highlighting the oscillation between iconoclast, iconophile, then again iconoclast attitudes of the rulers and of the ecclesiastical figures over the two periods. From the one period to the other, different contradictory laws of accepting, promoting, or rejecting icon veneration and idolatry in Christianity were ordained. During the two Byzantine Iconoclastic eras, this was marked by the laws drafted by: the iconoclast council of Hieria in 754 under Constantine V; the iconophile council of Nicaea in 787 under iconophile Empress Irene; and the Seventh Ecumenical Council of St. Sophia 815 under Leo V’s rule.⁸⁴

Elsner explains with some suspicion that the first act of Byzantine Christian iconoclasm was associated with the presumed removal of the pictorial figure of Christ from the Chalke Gate to the Great Palace of Constantinople, following the orders of the Byzantine Emperor Leo III in 726 (or 730) (“Iconoclasm as Discourse” 377). According to Elsner, these shifts in attitudes and legislations concerning the image of Christ have created a shift in Christian philosophy and theory from “ontological” discourse about the icon and divine nature to “epistemological”

⁸⁴ For a more detailed account of these periods, see Jaś Elsner’s “Iconoclasm as Discourse: From Antiquity to Byzantium.”

treatment of the image in “how the holy is to be known, worshipped and treated” (“Iconoclasm as Discourse” 379; 381; 382). Elsner thus distinguishes between two types of the discourse of iconoclasm: (1) the political one of memory damnation (from Greek antiquity and in “the Roman world to the 8th century in Constantinople”) which is meant to be an obliteration of “the real presence” of the preceding political figure in the image and thereby effacing the rival’s memory; and 2) Byzantine iconoclasm, which is, according to him, by no means an attempt to damage “the real presence” of Christ or God, but a questioning of the “appropriateness” of the image in “knowing, honoring, and accessing” the divine (“Iconoclasm as Discourse” 383–384).

Elsner believes that “the variety of positions offered during Byzantine iconoclasm constitutes one of the deepest conceptual contributions to the problem of the image as representation” (385)—which, coming from an art historian, is an interesting claim. For Elsner, the development in theories concerning the image in art in Western cultures is, in turn, influenced by the theological debates around the icon during the Byzantine Iconoclastic eras (386). The type of art history study offered by Elsner helps restore the connection implicitly established between references to art and the Hagia Sophia in *Plowing the Dark*. Furthermore, it helps to partly fathom the aspects of iconoclasm in the Hagia Sophia as explored in *Plowing the Dark*. *Plowing the Dark* portrays the iconoclastic practices in the Hagia Sophia within the different Byzantine epochs, as well as under the Roman and Ottoman empires, with an “impasse” approach that depicts them as mysterious and contradictory. Along the narrative, the novel also exposes the evolution of the image. It traces the development of its production, reception, and impact through and within the dynamics of art, theology, politics, and most especially, technology. In parallel, the novel explores the different forms of image, text, and mind conceptions. In this respect, *Plowing the Dark* delivers an equal retrospective *longue durée* approach, and it also expands into a futuristic anticipation of artistic evolution in visual art and literature.

Along with Jaś Elsner’s 2012 definition of icon and iconoclasm as polemical and shifting, my analysis relies on Bruno Latour’s 2002 definition of icon, iconoclasm, and “iconoclasm.” In the edited exhibition

catalog *What is iconoclash? Or is there a World beyond the Image Wars?* (2002), Bruno Latour similarly shows how icon destruction in Western tradition can be non-religious, shedding light on modern age fabrications. However, Latour uses a different method and categorization from that of Elsner when it comes to the combination of destruction and reconstruction. On the one hand, Elsner deals with destruction and preservation as two separate clear performances, existing within the same era or expanding through different epochs in discourses and laws. In the example of the Byzantine era, the two acts are practiced by different parties: different political and ecclesiastical power figures, or antiquarians.

In contrast, Latour differentiates between iconoclasm and “iconoclash” with the degrees of certainty and clarity of the act: whether *the one same* operation, at times even performed by *the same* hand, definitely falls under the goal of deformation and demolition, or whether it is not clear if the act itself is meant for preservation or destruction. The uncertainty of the act of destruction/reconstruction is, according to Latour, interpreted in the term “iconoclash,” with which he blurs the strict understanding of antiquarian and iconoclastic action (“What is iconoclash?” 14). “Iconoclash,” hence, marks “the hesitation” (18). Latour considers the irony behind antiquarian reconstructions and museums’ collections, following any iconoclastic activity. He positions them as an ironic form of apology for “the destruction of so much beauty, so much horror” and a way of “beginning the indefinite cult of conserving, protecting, repairing”; or as a form of regret “as if the destroyer had suddenly realized that something *else* had been destroyed by mistake, something for which atonement was now overdue” (15).

In addition to the destruction/reconstruction combination, Latour’s approach to “iconoclash” brings supposedly clashing disciplines; mainly, science, religion, and contemporary art, together, exhibiting them as “different patterns of image-making” (18). Latour raises the pressing question of why images bring “so much passion” and hatred (14). At the same time, he takes the opportunity to define the image as “any sign, work of art, inscription, or picture that acts as mediation to access something else,” and which involves not only religious faith, but also scientific objectivity, and artistic creativity (14). For Latour, bringing religion and

science together is already an act of iconoclasm, and these elements together create “*interference*” (18; 19). Latour additionally argues that modernist art has already announced “generations of iconoclasts” by “smashing” all laws of mimetic art and “experimenting against,” and with, everything possible (21).

In Part III, “Artistic Evolution: A case of *Iconoclash* through Interdisciplinary Thought,” I make use of the terms “iconoclasm” and “iconoclash” within the various contexts that are treated in *Plowing the Dark*. I deploy the term iconoclasm especially when dealing with the historical iconoclastic practices linked to the physical Hagia Sophia, and I use “iconoclash” in reference to the virtual prototype—but none of these applications are strict. “Iconoclash” is also here used to label the structures of the novel, which bring clashing disciplines, trends, and theories together in the narrative, and which occur as an act that is not clear in terms of whether it fits under the umbrella of destruction or construction. These disciplines are not restricted to religion, science, and art. They equally bring architecture, literature, and technology into the picture. In this case, I explore literary-technological iconoclash as 3D-CAVE narrative structure, architectural iconoclash in the virtual prototyping of the Hagia Sophia, and religious iconoclash through scripture cultivation. These target an in-depth analysis of the textual and narrative structure of Richard Powers’ *Plowing the Dark* to better understand the artistic evolution of the novel.

Hence, *Plowing the Dark* is picked as a sample of Powers’ practices in tracing, and experimenting with, artistic evolution, for *Plowing the Dark* offers enough structural and thematic overload of his strategies. Indeed, *Plowing the Dark* falls under a general technique that the other novels of Richard Powers equally sustain (in this case: *Galatea 2.2*, *The Echo Maker*, and *Generosity: An Enhancement*). The three other novels—treated in the previous sections—will be mentioned, with less precision and less in-depth analysis in this part, only to echo some of the similar techniques to *Plowing the Dark*. On the other hand, the focus on *Plowing the Dark*’s narrative structure serves to pinpoint Richard Powers’ innovative practices and artistically evolutionary trends.

b. Art between Agony and Evolution

Plowing the Dark explores an IT project of a virtual reality environment, called the Cavern, in Seattle. Adie Klarpol (a painter) joins Steve Spiegel (a poet) and a team of several engineers to work on the realization of different virtual rooms. The Cavern rooms can be the simulation of a jungle, a painting, a therapy room, or the Hagia Sophia. In a parallel narrative plot, a half-American and half-Iranian English teacher, Taimur Martin, is taken hostage by a terrorist group and kept blindfolded in total seclusion in Beirut, Lebanon. The plots are intersected by the outbreak of the Persian Gulf War. Therefore, the novel's narrative structures occur as complex strata.

In *Plowing the Dark*, the Seattle narrative plot portrays the virtual reality project as engulfing visual art, storytelling, and architecture in digital reproduction, and as absorbing the “painter” Adie and “poet” Steve in high-tech industry. It therefore signals an alert that original art is on the verge of becoming obsolete in the face of technological mass production and advances. The different trends of visual art are present in the novel through the naming of the virtual reality machines after the following painters: Da Vinci, Monet, Hsieh Ho, Rembrandt, and Picasso (*Plowing the Dark* 32). Van Gogh and Monet figure as inspiration to Adie, and Duchamp and Magritte as brief metaphors, possibly to the death of art.⁸⁵

As of art history and architecture, the virtual reality environment captures architectural iconoclasm and the debate over the image as an icon through the elaborate description of, and recreation of, the Hagia Sophia's structures, interior design, and décor. However, a twist on the engulfing process surfaces in the novel. By portraying the virtual reality Cavern as engulfing art and architecture, the novel's narratives absorb, in turn, everything else, including technology and science. The engulfing spin does not occur as a sign of the sovereignty of art and literature. Rather, it signals the frailty of both in the face of technolog-

⁸⁵ In his essay “An End to the ‘End of Art’? On the Iconoclasm of Modern Art,” Peter Weibel argues that the death of painting occurred through “the triangle of Van Gogh-Malevich-Duchamp” “from making colors absolute to self-dissolution of painting” (611). Weibel stresses that the death of art is from within, and he, therefore, labels it “the suicide of art” (611).

ical evolution. The frailty of art and literature is ambiguously captured while pushing their limits, in general, and the novel's limits, precisely, testing what borders and challenges the novel can reach and overcome to avoid becoming obsolete.

A similar state of frailty appears in *Galatea 2.2*, where the humanities go through a crisis in comparison to the technological and scientific disciplines. This possible effacement of the humanities in the face of shrinking positions and funding in a trend of the survival of the fittest discipline becomes entangled in the type of iconoclash created in *Galatea 2.2* and *Plowing the Dark*. This is clear in *Galatea 2.2* through the protagonist Rick, who is appointed as a humanist at the Center for the Study of Advanced Sciences; and in *Plowing the Dark*, through the painter Adie and the poet Steve, who deploy their art in a virtual reality laboratory in a high-tech industry. At the same time, both Rick and Steve drop their respective studies, in physics and “civil engineering (198–199),” and shift to the humanities, an act to which their parents react with deep disappointment.

Three of the four main characters in *Plowing the Dark* (Adie Klarpol, a painter; Ted Zimmerman, a musician; and Steve Spiegel, a poet) are portrayed as engulfed by commercial and technological advances and needs. Alone, their title as “painter,” “poet,” or “musician” is pronounced as the death of the artist, poet, or musician, sounding like an unofficial title, “a hobby,” or a teenager’s worn-out idealist fantasy that shies away from the bitterness of war and that is pushed away to the margins of the industrial world dominance. Before joining the Cavern, Adie works as a freelance illustrator, “designing” “commercial stuff” “for a living,” where painting is reduced to “copy and paste” (*Plowing the Dark* 10). When Steve offers her a job at the Cavern, he suggests that the Cavern could be an opportunity for her to “make art again,” as if art and artists, making “original work” are on the verge of extinction.

[Steve]: *I told them [TeraSys Realization Lab] about the award controversy. How one of the judges thought you were using projection? How he refused to believe that you'd actually freehand...*

[Adie]: Steven. *We were children then. You don't fly a stranger across the continent just to find someone who can draw. Courtroom portraitists are a dollar ninety-eight a square yard. Besides, I already have a life.*

You're not a stranger, Ade. He sounded hurt. That's what's so perfect about this. You don't have to stop painting. Just come out here and do what you –

Steve. You have the wrong person. I don't do ... I'm not painting anymore.

[...]

Did something happen? he asked.

Tons happened. Oh, all my parts are still intact, if that's what you mean. It's just that painting's over. No great loss, I assure you.

Loss? Adie! How can you say that? What ... what are you doing, then?

About what? Oh. You mean for work? I freelance. Commercial Stuff. Fliers and the like. Book jackets.

You'll do a book jacket but you won't ...?

Won't do original work. I have no problem with designing for a living. Copy and paste. All the pastel coffee mugs and cartoon cars that you want. But Art's done.

Adie. If you can still make... Do you see? This would be a chance to do something completely...

Sounds like you're looking for somebody else, Stevie. For the greatest illustrator since representation self-destructed. (Plowing the Dark 9–10 [my additions, my omissions])

This opportunity to *make art again* through the Cavern is a way for Steve to try to “save her (10)” or maybe to save art: “He is still that kid of twenty [...] still shepherding around the dream of starting an Artist's colony where he could gather all those who needed a hideout from the real world. [...] no one abandons his first survival kit. The most we ever do is upgrade the splints” (*Plowing the Dark* 8).

In *Plowing the Dark*, Zimmerman's short narrative plot starts first as a flashback of memories to his university time at the University of Wisconsin and merges slightly in adulthood in parallel with the Cavern narrative and Taimur's narrative, before it fades again to the dim background of the two other main narrative plots. Memories of the student lives of Adie and Steve portray a "colony" of amateur artists that ends in disillusion. The flashback to Wisconsin fleshes out fervent artistic zeal as students with different art interests meet to discuss and produce art: "Poetry, prose, sculpture, music, pictures: he'd underestimated the spread of the contagion. He'd stepped into the middle of an old blood feud, warring family factions contesting the last will and testament of this dead, penniless patriarch, Art" (*Plowing the Dark* 202). The group stands as a symbol of resistance to war through art during the Vietnam War. However, they are trapped in an unending controversy of "war between art and ethics," as Steve puts it (203). "Art was embroiled in the same conflict that claimed the Army Math" (203).

Madison was still reeling from its fatal bombing of the year. The Army Math Research Center in Sterling Hall, 'think tank of American militarism,' had been gutted by campus radicals in the single most destructive act of sabotage in American history. The air on Lathrop Drive was still electric. A brilliant young low-temperature physicist lay dead, and a major national university stood teetering between revolution and revolution, between *We can do anything* and *What have we done?* (199)

The group live together in a common house that becomes the hive of their artistic gatherings, before falling apart in their despair. The house is rented under a common bank account, ironically called, "Mahler Haus," which symbolizes revolutionary art in its hint at the composer Gustav Mahler and his followers Schoenberg, Webern, and Berg—Ted Zimmerman's real passion (*Plowing the Dark* 204–205).⁸⁶ The collapse of the "Mahler Haus," in the aftermath of the Sterling Hall bombing in August 24, 1970 symbolically touches on the hype of engaged and revolutionary art failing to save the world.

86 In addition, the homophone "Maler" means "painter" in German.

By spring, Mahler Haus lay sacked and ruined. The winds of possibility blew utopia apart. The Madison bombing had spelled the end of world revolution. The Mahler Haus experiment in group living spelled, for each of them, the end of idealism. Each creator retreated to his private bedroom, and the Grand Ballroom closed its doors on group communion for good.

“Things fall apart,” Ted told him [Steve]. “The center cannot hold.” But the man seemed untouched by the centripetal wipeout. (*Plowing the Dark* 210)

Whereas Ted Zimmerman lies at the margin of commercial music before becoming totally isolated due to multiple sclerosis, Adie and Steve join the engineering project of the Cavern, offering their artistic skills to the virtual reality environment. Adie’s and Steve’s stepping into the virtual reality project appears as an act of oscillation between *art sacrifice to technology* and *art revival by means of technology*. It launches a moment of epiphany at art agonizing, and at the same time, resurrecting in a different new form—a moment of iconoclash. The sort of iconoclash present here is, hence, an iconoclash of different media and disciplines. Absorbing other disciplines and media—and waltzing through technology—makes it unclear whether Powers’ novels are an attempt to revive the novel, or to show its frailty at the possible obsolescence of the genre. This iconoclash moment paves the way for artistic evolution through interdisciplinarity.

In a personal interview with the engineers Bo An and Pham Cuong at Nanyang Technological University in Singapore in November 2019, a recurrent question arose as to how the humanities and engineering could work together to bridge the gap in between extremes of hype and fear over the future of technology and its impact on humanity and the humanities. The question could form the foundation of a critique based on a more grounded perception of both fields that constantly clash or come together as in technological narratives and art, starting with photography, film, and virtual reality. It is a merger that, to some, correlates with a threat to art and, to others, presents an opportunity for artistic evolution and experimentation.

The following are examples of contemporary art, which experiment with technology: the installation of the spinning robotic arm, *Can't Help Myself* (see Fig. 2) by Chinese artists, Sun Yuan and Peng Yu (Central Pavilion, Giardini, Venice Art Biennale 2019 *May you Live in Interesting Times*), and the sculptural installation *Blocked Content* (see Fig. 3) by Recycle Group, Andrey Blokhin and Georgy Kuznetsov (Russian Pavilion, Giardini, Venice Art Biennale 2017 *Viva Arte Viva*).

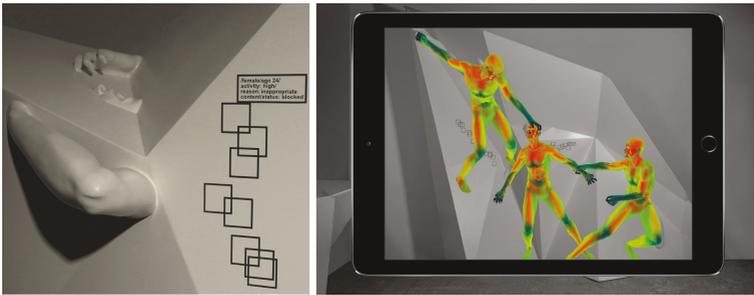


Fig. 3 Recycle Group, Andrey Blokhin and Georgy Kuznetsov, "Blocked Content", Venice Art Biennale "Viva Arte Viva", Russian Pavilion, Giardini, Venice, 2017 ©Recycle Group

Blocked Content exhibits fragmented plaster-white body parts, surfacing from sharp angles of plastic wall revetments. The piece of art is complete only via the viewer's use of a virtual reality mobile application to be installed on their smartphones, the exposure of which displays the body parts as 3D full interacting bodies in fluorescent green and orange holograms. Analogously, Richard Powers uses technology to his advantage to experiment with the form that emerges by mixing science, technology, and literature: *The Echo Maker* is written through a speech-to-writing recognition machine, *Galatea 2.2* explores recreation of the mind through artificial neural networks, *Generosity* works with human gene editing, and *Plowing the Dark* makes use of the virtual reality CAVE structure.

By reaching out to other disciplines, *Plowing the Dark* traces layers of narrative structures that follow patterns in virtual reality, architecture, and religious text. These interdisciplinary iconoclash instances are examined in detail in the following chapters of Part III: 6) Literary-Technological Iconoclash: CAVE-Narrative Structure; 7) Architectural-Literary Iconoclash: Virtual Hagia Sophia; 8) Religious-Literary Iconoclash; and 9) The novel as Crafted by Richard Powers.

Chapter 6 Literary-Technological Iconoclasm: CAVE-Narrative Structure

Naming the virtual reality project, “the Cavern,” in *Plowing the Dark* does not differ much from the technical naming in computer laboratories. The technical name is the acronym, CAVE, which is derived from “Computer Audio-Visual Experience Automatic Virtual Environment,” and which is the “fourth visual paradigm for virtual reality” after the Cathode Ray-Tube (CRT), the Head-Mounted Display (HMD), and the Binocular Omni-Oriented Monitor (BOOM) (Cruz-Neira et al., “The CAVE” 65–67). The CAVE is an enhancement of immersion creation, in comparison with the three previous interfaces. It is a room-like space that integrates not only surrounding display screens, but also a motion-tracking system to constantly identify the position and movements of the user and offer them a sense of the viewer’s perspective.

Carolina Cruz-Neira, pioneer of virtual reality and inventor of the CAVE, explains that the CAVE is “a cube with display screen faces surrounding a viewer,” and she elaborates that it is “similar to surround systems such as OMNIMAX theaters and early flight simulators. Its more recent instance is coupled with a head-tracking device. As the viewer moves within the bounds of the CAVE, the correct perspective and stereo projections of the environment appear on the display screen” (“The CAVE” 67). The CAVE technical name is also a hint at, or a borrowing from, Plato’s allegory of perception in Book 7 of the *Republic*, as Cruz-Neira puts it (67). Apart from the symbolism to the CAVE, the Cavern in *Plowing the Dark* stands for several more emblematic references. These convert the structural make-up of the novel into literary-technological iconoclasm via artistic-and-narrative digital upgrade.

6.1 Image Construction in Art/Technology

6.1.1 Image Mutation

One of the multi-symbolic layers of the Cavern in *Plowing the Dark* is an allusion to prehistoric cave drawings. The following passage, taken from chapter 17 in *Plowing the Dark*, establishes a connection between the technology of virtual reality and cave painting from the Late Stone Age: “Lim came through one evening, agitated from reading a new book on prehistoric art. *You have to read this. The author claims that the Upper Paleolithic caves were the first VR*” (*Plowing the Dark* 129). In this respect, the Upper Paleolithic cave and the Cavern (CAVE) act as a trajectory of artistic evolution in the novel. The trajectory delineates the course of the evolution of visual “art” from cave drawing to virtual reality “drawing.”

[Steve] Spiegel expressed her [Adie] the promotional brochures. In them, glossy images traced the Cavern back to the underground grottos of paint’s nativity. In faded watermark beneath the tables of hardware specs, she could make out the faint traces of those Paleolithic herds, stained into stone thirty millennia before art even gave itself a name. Spectral digits, stenciled to the rock – outlines of the same phantom fingers that applied the rouge – waved at her from out of the world’s original apse. And across the folds of the glossy brochure, from three hundred centuries on, 3-D, multiplanar, true-color, walk-around holograms waved back. (*Plowing the Dark* 10–11)

The novel highlights variations of artistic trends and movements within the trajectory of prehistoric caves/Cavern. Adie names the virtual reality servers after painters’ names: Da Vinci, Claude, Hsieh Ho, Rembrandt, and Picasso. She interjects:

OK, how’s about we call this one Da Vinci? He was pretty technological, huh? Inventing submarines, writing backwards, and all that. This one can be Claude. After all, we’re going to be cranking out landscape by the gross hectar. Then here’s Hsieh Ho, giver of the Six Principles...

Jackdaw cleared his throat. *Is that anything like the six degrees of freedom? And we'll need a Rembrandt. For a lifetime devoted to the play of light against dark. And the last one ought to be Picasso – (Plowing the Dark 32)*

Other artistic references in the novel are attributed to Van Gogh, Monet, Duchamp, and Magritte. Along with the development of different types of artistic trends and movements (prehistoric cave drawing, mosaics, renaissance, baroque, landscape, realism, impressionism, pointillism, expressionism, cubism, abstract, and surrealism) there is a parallel shifting pluralistic trajectory of techniques in form and medium. The artistic techniques and movements overlap, intersect, and diverge in a non-linear fashion, highlighting a multiplicity of variations.

As the narrative unfolds, references to art keep multiplying in connection with the virtual reality space that starts to function as a virtual archive of art variations. The Cavern is used to replicate original art pieces in voxel and digital color palette and brushes. Here, art joins a more “technological” realm that it helped to start in the first place.

Adie held up her hand to stop the stream, until she could improvise a bridge across it. *You're saying that cave art begets all this? She waved to include the whole RL [Realization Lab]. That Lascaux starts a chain reaction that leads to ...?*

I'm saying that art explodes at exactly the same moment as tool-based culture. That cave pictures prepared the leap, after a million and a half years of static existence. That pictures were the tool that enabled human liftoff, the Ur-tech that planted the idea of a separate symbolic existence in the mind of – (Plowing the Dark 130)

Image construction has migrated within the variations of primitive and more advanced technological methods and tools. Prehistoric cave drawings figure in shadow-like images in limited colors, such as red, charcoal, yellow, brown, and/or orange. Still, they are considered sophisticated, demonstrating a great deal of artistic knowhow as seen not only in the paintings of the Lascaux caves but also in the precursor

drawings of the Chauvet-Pont-d'Arc cave in Ardèche, France, originating 36,000 years ago (*Secret* 00.19–00.24; 00.43–00.50; *Caverne: The Replica* 00.10–00.16; *Chauvet2* Personal Visit). Both show techniques of 3 dimensions on the walls by meticulously painting multiple elements in different sizes and positions, while using the rock formation to create depth (see Fig. 4; *Secret* 00.24–00.30; *Chauvet2* Personal Visit). The scene of the lions hunting a herd of bison, as seen in Fig. 4 below, displays complexity that gained the Chauvet prehistoric paintings the label of “the first great masterpiece made by man” (*Secret* 01.25–01.28; *Chauvet2* Personal Visit).

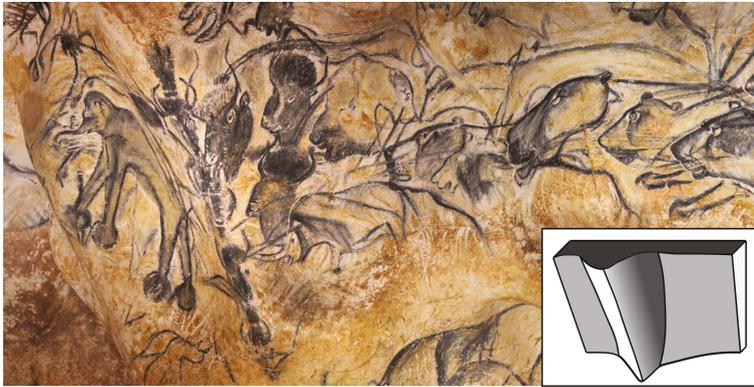


Fig. 4 From Patrick Aventurier, “Détail du Panneau des Lions,” Chauvet, Ardèche, 2015 ©Patrick Aventurier—Caverne du Pont d’Arc; Schematic Illustration of the Wall Contour

The tools to construct an image developed from primitive techniques of “blotting” and engraving rocks and cave walls to using the cave “space and perspectives,” creating “charcoal depictions” in a ‘primitive’ form of 3 dimensions (*Secret* 00.24–00.30). Painting further evolved with different techniques of brush movements, oils, acrylics mixes, and canvas types and sizes. The evolution of experimenting with image construction and medium is displayed in retrospect with the introduction of digital painting in the virtual environment CAVE. As presented in the Cavern brochure, the image mutates now into the form of “3-D, multiplanar, true color, walk around holograms” (130). With the immersive attribute of the Cavern, the upgrade not only includes looking around objects, but transforms the image space to walk into the surrounding environ-

ment,⁸⁷ which, in turn, revolutionizes prehistoric cave immersive sensation into audio-visual computer-automated virtual experience.

The fabrication of paintings in Cavern computer-automated virtual space brings about a revolutionary technique of picture construction. Steve describes image construction in the Cavern as a mechanical routine of digital “drawing by numbers” via computer-automated virtual reality environment: “It’s not paint, he said. No paint involved at all. No original expression required, Ade. It’s all drawing by numbers, out here. Don’t think of it as art. Think of it as a massive data structure” (*Plowing the Dark* 17). Whereas cave drawings figure as pre-art, or the origin of art, Cavern’s graphic composition is presented by Steve as “drawing by numbers” in a non-artistic data-mining process; as a form of non-art or post-art.⁸⁸

6.1.2 Pixilation

Through the Cavern, digital image construction and substance shift from pixels to voxels and stereoscopic effects. Steve updates Spider Lim’s image terminology when the latter tries to correct Adie’s.

[...] Adie demurred. *Change one ... one mark on it and I’ll kill you in your sleep.*

Pixel, Spider corrected. *Change one pixel. And you’ll kill us.*

Voxel, Spiegel overtrumped him. *Keep current, will you, Lim? Voxel or boxel. A 3-D pixel.* (*Plowing the Dark* 15)

Adie’s first walk in the Realization Lab expands into a reflection on the virtual reality Cavern and on the accumulated cave structure of “stalagmites.” The passage reads as follows: “Steve gave her an impatient tour of the facility, under the compact fluorescent lights. Then he hurried

⁸⁷ Look-around capacity of different VR systems, including the CAVE, is also briefly discussed by Carolina Cruz-Neira et al. in “The Cave Audio Visual Experience Automatic Virtual Environment” (69–70).

⁸⁸ For a full study on the birth of art in the Lascaux caves, see Georges Bataille, *Lascaux or the Birth of Art*.

her down the maze of runways, back into a room that opened onto a stalagmite-strewn pitch-blackness” (11). The description of the Realization Lab as an artificial dark cavern full of stalagmite-like cables, highlights the accumulating process in form through an exponential span of time. In natural grottoes, stalagmite structures emerge and take shape through cumulative ceiling drippings of different natural materials on the ground over an extended period of time. The stalagmites’ silhouette, being composed of fractions of drops into a rising crystal-like shape, echoes the pixels and voxels artificially comprising numerical dots to form the digital 2D and 3D images, respectively. The hint at dots and pieces is also seen in references to mosaics—described as the “world’s first bitmap” and “pixilate” “resolutions” of “discrete rectangles” (*Plowing the Dark* 343)—and pointillism, which in the Cavern migrates from a non-digital technique of art to a technological platform of instant options.

Math does all this, Adie chanted. All some kind of – The greatest paint-by-numbers kit in the universe.

[...] Submenu Art Effects. Submenu Filters. Submenu Artist Styles. Pointillism. Seurat. Their grafted leaves speckled into something from the Grande Jatte. The imitation was uncanny—an exact running average, strained on the mottled leaf, of every dot that the dead painter ever applied to canvas. (41)

In the virtual reality Cavern, trends and painters’ styles become ready-made digital submenu options that add effects to the color palette, light, form, and brushstrokes. The submenu items are named after specific artists: Giotto, Caravaggio, Van der Weyden, Rothko, Rubens, Poussin, Mary Cassatt, Gauguin, and Franz Marc (*Plowing the Dark* 40–41). The function makes the artists’ idiosyncratic painting techniques “reproducible” with a simple click. The Cavern is used to replicate original artwork in digital hues and brushes.

6.1.3 Art Digitalization

The novel further experiments with the iconoclasm between art and technology. The description of the Realization Lab transitions to more digital references and conceptual art: “Stray, chaotic caches of chrome appeared on all sides of her [Adie], evil little Duchamp originals. Banks of lights blinked out of the pitch, like the beady red eyes of robotic rats. Connectors and controllers littered the floor, the metallic droppings up on those circuit creatures” (*Plowing the Dark* 11). Adie becomes appalled at the structures of the Realization Lab (RL), which are depicted as “metallic droppings” appearing like “a sea of digital serpents” (11). When Adie visits the room that hosts the Cavern’s graphics engines, the digitalization of art fills her with bewilderment and mixed feelings at the supposed “defeat of art” and its “aesthetic den of denial.”

Shame and amazement did a two-step inside her. This room was this present’s wildest accomplishment, its printing press, its carrack and caravel, its haywain, hanging gardens, and basilica. These demure, humming boxes contained the densest working out, the highest tide of everything that collective ingenuity had yet learned how to pull off. It housed the race’s deepest taboo dream, the thing humanity was trying to turn itself into. Yet for all that Adie had seen, art had fled headlong from it, in full retreat, toward some safe aesthetic den of denial, where it could lick its wounds in defeat. (30)

Nonetheless, in contrast to the dull metallic feel of the RL, the Cavern opens up to creativity. In *Plowing the Dark*, the Cavern appears as white screens that welcome imagination. It offers a flexible and pluralistic medium that could contain several environments and reconstruct paintings, architecture, and other simulated special and artistic structures as “walk-in, graphical worlds” (*Plowing the Dark* 9). Steve walks Adie towards the Cavern for the first time: “He pointed toward a luminous opening, a glowing white shoebox, shining like a lit stage set in general dark” (12). The tour carries on in the Cavern into borderless immersive space: “They stepped together through the missing rear wall, into the glowing room. Just like that: the audience, walking

through an invisible proscenium, onto a floor-level stage. Adie found herself standing in an empty space, six by eight by ten feet, made from five large rectangles of white sandpaper. Even the floor and ceiling were movie screens" (12). The multiple surrounding screens and projections "erasing all sense of cubical" space and engulfing Adie's presence within the graphical space trace culmination and subversion of realist, cubist, conceptual, and surrealist art, creating technological-artistic iconoclash at the level of image space and perception.

Adie's perceptive reaction to the virtual reality environment captures the play on artificial perceptive and immersive evolution. The following passage reveals:

She [Adie] looked up. The teal tent above them now billowed with cloud. She looked down at her shoes. They skimmed over the tops of trees, trees rooted well beneath the floor that projected them. Each crayon image slid seamlessly over the room's corners, erasing all sense of the cubicle that they inhabited. A few trillion bits of math, to fool a few billion years of ocular evolution: after a few seconds, Adie stopped noticing the conjuring act and began to believe. (14–15)

However, perception is not the only aspect that displays distortion due to tracking. As seen in the following passage, auditory reception undergoes similar confusion due to the surround effect: "His [Steve's] voice seemed to come from just to her left, though Adie would never again trust her sense of distance. As she turned around to look at him, the Crayon World wrapped around her, tracking her head" (15). The Cavern's walk-in, multiplanar, surround display screens reflect Cruz-Neira's CAVE attempt to evolve the viewer's perception and interaction with the image and narrative in simulation of the viewer's real visual angle of, and interaction with, reality. The Cavern extends, and makes use of, "field of view freedom," "viewer-centered perspective," body and physical representation, and the degree of disbelief through immersion combined with the right amount of intrusion ("The CAVE" 67–68). These elements are replicated in the Cavern in *Plowing the Dark*, making the novel's narrative virtual.

6.2 Stereoscopic Narrative Construction

The CAVE is invented to offer an immersive and interactive environment of image and narrative with stereoscopic auditory, visual, and haptic effects. *Plowing the Dark* reworks the stereoscopic effect within its narrative structure.⁸⁹ Narrative creation, in *Plowing the Dark*, hints at Plato's allegory of the shadow reflections projected through fire light and darkness in the cave, puppet theatre, AUDIOMAX, hologram, and the virtual reality Cavern. All allusions figure in parallel with references to different narratives, storytelling, poetry, and novels from different cultures and time spans. Hinting at Upper-Paleolithic cave drawings in general, and specifically to the Lascaux Caves, the Cavern reflects the possible emergence of narrative in the form of images in the prehistoric grottoes. This could be understood from the portrayal of daily life elements or animals in shadow-like sketches. Indeed, the lions in the Chauvet-Pont-d'Arc cave, are explained to "still amaze scientists today due to their aesthetic qualities and the subtlety of the narration that reveals an undeniable artistic talent" (*Secret* 00.43-0050; *Chauvet2* Personal Visit). Respectively, and as *Plowing the Dark* alludes to, the VR Cavern recreates the immersive effect of, for instant, the Lascaux Caves in a more technologically and artificially sophisticated model via computer-automated virtual reality. *Plowing the Dark's* narrative construction reflects on VR immersive and interactive techniques of the CAVE through exploring the creation of the Cavern, rethinking the evolution of image construction along with different forms and trends of visual

⁸⁹ In his "Asynchronous Messaging": The Multiple Functions of Richard Powers' Fictions," Heinz Ickstadt offers an overview of a "three-dimensional depth"—a "stereo" or "parallax view"—in the narrative construction of Powers' *Three Farmers on Their Way to a Dance*, which is created through the characters' narrative voices (28–30). Ickstadt equally points out that the technique is recurrent in Powers' novels: *The Gold Bug Variations*, *Gain*, *Plowing the Dark*, and *The Time of Our Singing*, stressing in *Plowing the Dark* only two narrative plots (28; 31). My analysis of *Plowing the Dark's* narrative as stereoscopic, three-dimensional, relies on several other elements, rather than the characters' voices and simple 3D structures, while revealing more than two plots. I explore the narrative in a more sophisticated virtual reality system, which is the CAVE—highlighting not only the stereoscopic effect but also a walk-in immersive and interactive effect of narrating in full scale. I, therefore, detail the analysis to lay out the intricate components and techniques that create the CAVE-like narrative.

art and narrative, from prehistoric grotto illustrations and shadows to the CAVE virtual environment.

Through the interactive and still-sickness effect of hypertextual overload, the narrative structure of *Plowing the Dark* engenders a stereoscopic impression, tricking the mind into a three-dimensional, immersive, VR-like narrative environment. This invites a revising of literature in the light of literary-technological iconoclasm, where it is not clear, on the one hand, whether technology (ab)uses literature or literature (ab)uses technology, and, on the other hand, whether this use is meant to destroy previous narrative forms or construct a new intermix. Therefore, in this context, the term “iconoclasm” is more valid than “iconoclast.” The notion of “iconoclasm,” in Latour’s sense, is present in Powers’ novels in the form of print, narrative structures merging with technological effects, and the co-presence of science, literature, visual art, and technology, which comes across as a non-clear relation of co-destruction or complementarity and construction (to adopt Latour’s notion of iconoclasm).

Whereas it is common to think of a rigid split between technology and literature, the novel—being a printed book—is a technological artistic manuscript. For Ray Kurzweil, the printed book is a technology, and in that sense, it is not safe from the possibility of becoming obsolete. Kurzweil writes:

Picking up a fat volume that I recently acquired, I consider the bookmarker’s craft: 470 finely printed pages organized into 16-page signatures, all of which are sewn together with white thread and glued onto a gray canvas cord. The hard linen-bound covers, stamped with gold letters, are connected to the signature block by delicately embossed end sheets. This is a technology that was perfected many decades ago. Books constitute such an integral element of our society—both reflecting and shaping its culture—that it is hard to imagine life without them. But the printed book, like any other technology, will not live forever. (*Singularity is Near* 51)

Plowing the Dark places a similar weight on the printed book by positioning it in a parallel narrative plot to the Virtual Reality Cavern, desig-

nating them as counterpart icons. Whereas the Seattle narrative is heavily based on the explosion of technological advances, culminating in the CAVE and its algorithms, Taimur's narrative in Beirut, Lebanon, is heavily constructed on the absence of technology. There, only a book is allowed, making it the only technology available to Taimur. *Plowing the Dark* rethinks the printed book, and indirectly the novel, as a technology that may go obsolete if not upgraded. Hence, the narrative structures intermix with new technological aspects, which render stereoscopic multiplanar immersion.

As mentioned earlier, the narrative in *Plowing the Dark* splits into two major stories: the Cavern in Seattle and the hostage place in Beirut, Lebanon. A third plot, involving the “musician” Ted Zimmerman, comes in a short faint story line, functioning like a “hidden-line removal.” The three narrative stories in *Plowing the Dark* work as a triangular three-dimensional space. They function as three layers of stereoscopic fashion in imitation of virtual reality, infusing the narrative with an impression of 3D structure. The character, Vulgamott, who is an architect working with the Cavern team, introduces elementary 3D geometry: “Wire frame. Skeleton. Whatever. Groups of graph primitives: triangles, polygons. Hidden-line removal creates the sense of three-space. Lots more verisimilitude. But tons slower. Tons harder to draw” (*Plowing* 36). As the narrative unfolds, the two major plots alternate in the novel and, hence, in the brain, creating three-dimensional depth in the novel's narrative structure. This effect is amplified as the Zimmerman short narrative creates a parallel haunting story, adding further depth to the stereoscopic fluctuation of the two major narratives.

Jackdaw explains to Adie the virtual reality stereoscopic effect in the Cavern, which echoes the technical definition by Carolina Cruz-Neira, and which underlines the alternation effect in the narrative structure of *Plowing the Dark*:

The stereoscopic effect comes from the glasses. Shuttered lenses. We've settled on a hundred-and-twenty-hertz oscillation. Alternate left-eye and right-eye views, each flashing sixty times a second. We sync the projected images to the shutter rate. Your eyes put the two back together. That's where you get the sense of depth. The stereo 3-D. (Plowing the Dark 27)

The character Jackdaw carries on: “*our rendering rates don’t come near to sixty frames a second yet. But as it turns out, the eye only needs about a dozen frames a second to trick it into fusing discrete images into continuous motion. Film is only twenty-four. So anything over thirty is more than adequate*” (28).

The alternation of the two major plots with a third faint plot creates narrative oscillation, tricking the mind into a stereoscopic story effect. The three-plot narrative uses different disciplines that touch on the creative part of the brain and the mathematical part of the brain: visual art, literature, architecture, history, engineering, mathematics, and geometry. By so doing, it oscillates fiction, creativity, imagination, memories, and facts. The interdisciplinarity of the narratives alternates right-brain and left-brain cognitive capacities. In similar ways to the effect of “the projected images to the shutter rate” on the eyes, the brain puts the narratives and disciplinary elements “back together” creating the stereoscopic effect of depth in the mind. The fictional character, Jackdaw, echoes the technical description by VR pioneer, Cruz-Neira. He explains that “[*the Cavern team does*] *it all with liquid crystal back projection. One Electrolamp Luminox projector throwing alternating double-buffered images onto each of the five walls. We cast the floor onto a refracting mirror, through a hole in the ceiling*” (*Plowing* 26). The technical definition of Multi-Stereo Displays by Carolina Cruz-Neira et al. reads as follows: “StereoGraphics divides the VGX frame buffer into two half-vertical-resolution fields, one for each eye. The user wears liquid crystal glasses that shutter at the field rate of the displays, synchronized by an infrared signal. At a rate of 60Hz (30 Hz per eye) the display flickered noticeably at highly disparate areas. Hence, the update rate was double to 120 Hz” (Cruz-Neira, “The CAVE” 71).

With the two major plots and a short “hidden-line” story, *Plowing the Dark’s* narrative tricks the brain—while reading it—into an in-depth virtual and interactive reality. The two major narratives create parallelism between vivid visual description of the Cavern virtual environment, on the one hand, and vivid memory flashbacks in Taimur’s mind. Taimur is kept blindfolded, and is held in total isolation from any forms of technology. In absolute solitary confinement and the absence of technological exposure, his memories and imagination intensify. In the pro-

cess and following his pleas for something to read lest he goes insane, Taimur is granted a book. In parallel, the Cavern's virtual reality intensifies through the visualization of the different virtual reality rooms as they come into realization. As the parallelism between the two plots accelerates, the two major narratives (Taimur's immersive imagination and memory while blindfolded, and the Cavern's virtual reality) function like a multiplanar "refracting mirror." These multiplanar narratives comprise, in turn, an overload of information and disciplines. The story plots and characters along with the hypertextual and interdisciplinary overload "flicker noticeably at highly disparate areas," transforming the novel's structure into a virtual reality narrative structure.

Along with the multiplanar narratives and information overload, visual descriptions of the digital creatures, displayed in the Cavern's virtual environment, infuse the reader's mind with 3D depth and "still-illness" (*Plowing the Dark* 14) effects:

Oh God! Adie shouted. Little bees. And they're buzzing!

Crude Black-and golden scraps with loops of straightened paper-clip wings jittered about in organized confusion. Something turned over in her, as small, as social, as buzzing and robotic as the living original.

They like it around the flowers. Steve pointed off into a glade. *Try waving the wand over there.*

She did. The magic scraps of would-be bees swarmed after every trail of digital scent she laid down willy-nilly. (16)

The above descriptive passage involves visual, olfactory, and auditory senses through the "buzzing" sound and "digital scent." These amplify at the intensity of visual kinetics and immersive effect in the sentence, "each time she cocked her head, the trailing wires that tracked her goggles pulled the whole landscape in her sight's wake" (17). The senses, kinetics, and 'stillness sickness' heighten as the terms "wingovers and Immelmans" are introduced.

Adie soared and looped and rolled. Each time she cocked her head, the trailing wires that tracked her goggles pulled the whole landscape along in her sight's wake. She waved the magic wand through ever more elaborate wingovers and Immelmans. She skimmed above the trees and plowed through furrows between the grass blades. She navigated out to the farthest walls of this confinement and jiggled the ground beneath her feet with her giggling.

[...]

But inside this womb of cool engineering, ingenuity schooled its hatchlings by moonlight. (16–17)

The immersive sensation, motion, and stillness sickness—vivid as they appear—are artificially stimulated by the Cavern's virtual reality. With the statement, “[b]ut inside this womb of cool engineering, ingenuity schooled its hatchlings by moonlight,” the artificiality of creation in the computer-automated systems comes to the foreground (*Plowing the Dark* 17). The statement raises the question of whether technological evolution leads to artistic evolution or destruction, in a form of artistic-technological iconoclash. As mentioned earlier, the two major plots that alternate draw a link between the Cavern and the brain. The artificial “womb of engineering” becomes the biological mind in the virtual memories, enacted in Taimur's presence of mind during his physical and sensory isolation as he is kept chained and blindfolded in solitary captivity. The mind displays a biological virtual reality, acting as an immersive environment that generates an infinity of renewable vivid imagery and sensory interaction. This mind–Cavern link is highlighted in Lim's findings. The fictional character Lim interjects:

You have to read this. The author claims that the Upper Paleolithic caves were the first VR.

[...]

No. Literally. Theatre-sized, total immersion staging chambers where they'd drag initiates by torchlight. The shock of the supernatural sound-and-light show supposedly altered the viewer's consciousness [...] Can you imagine?

*Catching your first ever glimpse of images, flickering out of pitch-darkness.
Like nothing you've ever seen. Your deepest mental illusions made real.
(129–130)*

Lim then follows up: “*The mind is the first virtual reality*” (*Plowing the Dark* 130). In a later passage in *Plowing the Dark*, the connection between VR and the mind is traced as enabling the promise of art to subvert the entity of physical substance and materiality: “Of course the Joint Chiefs wanted what art promised: to break the bonds of matter and make the mind real” (396). In turn, this brings about the evolution in the metaphor of the mind in relation to each new technology: from clock, telephone switch board or a black box in the stimulus-response theory, to a map-controlled room in cognitive maps, computers, and algorithms in connectivist thought, and now to the VR CAVE. In between the mind-CAVE bridge lies the novel. Hence, *Plowing the Dark* experiments with virtual reality simultaneously in the Cavern, the mind, and the novel. This mix traces an exponential and interdisciplinary artistic evolution.

6.3 Narrative Immersion and Intrusion

As presciently shown, *Plowing the Dark* creates immersive and “still-illness” effects in the reader’s mind by alternating and flickering multi-planar plots, along with an overwhelming load of information, disciplines, and different environments. The novel’s use of mental visual processes, and vivid descriptions of virtual imagery, functions as a simulation of the CAVE, emulating mental visualization and audiovisual experience. While Cruz-Neira describes the CAVE in similarity to OMNIMAX theaters and virtual reality as a simulation of visualization from the location of the viewer (65), *Plowing the Dark* digs further beyond the OMNIMAX reference and human visual perception. The novel compares virtual reality to mental visualization (imagination, memory, thought processing, and dreams) and the Cavern to the brain. In *Plowing the Dark*, the novel, the Cavern, and the brain converge on the metaphor of immersion. Cruz-Neira explains that “suspension of disbelief” and “viewer-centered perspective” are crucial points in describing virtual reality systems (65). The most important aspect of the CAVE is

to create immersion, which is, as she puts it, “the degree of visual simulation a virtual reality interface provides for the viewer – the degree of suspension of disbelief” (67). At the same time, the CAVE’s forte is the juxtaposition of immersion with a loose degree of intrusion, in comparison to the completely isolating HMD. Additional fundamental markers of immersion in CAVE processes are: “maximal field of view” in 360 degrees, panorama display that fully simultaneously surrounds the viewer, “viewer-centered perspective,” and the “body and physical representation” of the user (68). *Plowing the Dark*’s narrative uses similar immersive techniques of the CAVE to those exemplified below.

Plowing the Dark’s narrative recreates immersion through the use of the second personal pronoun. The second personal pronoun “you” is adopted throughout Taimur’s plot. In the Seattle plot, the second personal pronoun is used only rarely in passages where one of the Cavern team members plays with the virtual models. With the use of the second personal pronoun “you,” the narratives absorb the reader into a CAVE-like, walk-in environment. The personal pronoun “you” functions like an avatar of the reader. It intensifies the sense of immersion as it operates physical representation of the reader in the novel. Mostly, it appears in the novel’s fictional and virtual spaces. However, for CAVE-like immersion to function properly, total intrusion has to be limited, as seen in the CAVE example.

Intrusion in the novel is loosened through the adoption of factual layers. The technique of mixing facts and fiction together in *Plowing the Dark* recreates a CAVE effect of both immersion in virtuality and “non-intrusion” (to use Cruz-Neira’s terminology; “The CAVE” 68). “In such environment” this gives the reader—just like the CAVE viewer—freedom “to move at will, secure in the awareness of the real, as well as the virtual, aspects of the environment” (Cruz-Neira, “The CAVE” 68). In *Plowing the Dark*, spatial settings are recurrently a dark room: the Realization Lab, the Cavern, the rooms in the Cavern, Zimmerman’s room, Adie’s room, and Taimur’s hostage room, etc. Along with this spatial confinement, some passages dive completely into an isolating virtuality through Cavern scenery viewed in HMD (head mounted device), the Zimmerman plot, and the passages where Taimur is blindfolded and chained in a dark room. These offer—like the traditional

HMD's highest intrusiveness experience—"complete isolation from the real environment" by "severely restricting the senses" (68).

Hence, the novel's title, "*Plowing the Dark*," translates into plowing virtuality, enacting absolute immersion in, and exploration of, the virtual. In parallel, there is an intended difference in the degree of immersion between the CAVE and the traditional HMD, leading to a lower level of intrusiveness. While the traditional HMD cuts the viewer completely off from the real world by blocking their senses to the real, Cruz-Neira's upgraded CAVE HMD glasses ensure a combination of immersion and non-intrusiveness through access to the real while submerged in the virtual (Cruz-Neira, "The CAVE" 68). She elaborates that "using half-silvered mirrors allows a viewer of HMD to see the real environment superimposed by objects in the virtual environment" (68). *Plowing the Dark* plays with a similar juxtaposition of immersion and non-intrusion by overlapping degrees of the real and the virtual, as well as the fictional and the factual. The novel superimposes fictionality with strata of real and factual accounts from the first Gulf War, the hostage crisis in Lebanon, CAVE creation and use, famous paintings, and the Hagia Sophia. Total immersion is, additionally, introduced again in the passages that describe the war through smart weaponry, and is, nonetheless, juxtaposed by the illusion of non-intrusion through Adie's skeptic questioning. The novel displays further overlays of immersive and non-immersive capacities through the Cavern creation process and the team members' debates that contrast and accentuate the Cavern's virtuality.

Similarly, a play with the field of view occurs in *Plowing the Dark*. In certain passages the field view enters a totality of 360 degrees through the virtual and mental imageries, while in some other passages, it is limited. Whereas all senses are restricted in the passages where Taimur is kept blindfolded in isolation and is tormented by his imagination and memory, creating a HMD-like total immersion and intrusion, the field of view in these passages does not reach a maximum of freedom since HMD systems allow only 100 to 140 degree vision.⁹⁰ When Taimur is

⁹⁰ According to Cruz-Neira et al. the field view is related to the range of vision without head rotation, which reaches a total of 360 degrees of freedom in CAVE systems and only 100–140 degrees in HMD (Cruz-Neira, CAVE Audio Visual 67). Panorama, however, relies on surround display system combined with "head rotation" (67).

not blindfolded, a limited field of view is also offered. In the dark hostage room, Taimur cannot comprehend either the room dimensions, or the reason and totality of his embroilment in the hostage-confinement “game.” The same happens to Adie when she realizes the possibility of her involvement in the development of Gulf War smart weaponry. The flickering three-plot narrative and the interdisciplinary overload help intensify the field of view to reach the CAVE’s maximum 360 degree vision.

CAVE-like panorama surround screens are also reproduced via recurrent mini-chapters throughout the novel. The mini-chapters act like surround display panels that are intended to reveal all outlook ranges. This aspect is further explored in the following sub-chapter, “Narrating in Full Scale.”

6.4 Narrating in Full Scale

Plowing the Dark aims at full-scale narration, like CAVE architectural modeling. Analogous to architectural CAVE design, narrating in one-to-one scale marks greater transformation in representation and visualization. In their article “Is it Possible to Design in Full Scale?” Chiu-Shui Chan et al. promote the position that, thanks to VR “immersive and interactive” capacity and the development of the Virtual Architectural Design Tool (VADeT), advanced VR systems used in C2 enable architectural planning of “full-scale virtual models” (“Is it Possible” 45).⁹¹ They argue that the C2, which is the second version of CAVE, is “a full-scale space for projection and perception providing the place to implement the concept” (45). They explain that “Inside the C2, this VADeT system has a number of metaphorical icons symbolizing tools for selection. Tools are available for defining materials and colors, and hierarchical 3-D solid modeling operations can build up, take away, and edit an electronic building online” (Chan et al. “Is it Possible” 45).

VR environment for design in one-to-one correspondence promulgates the terms “real dimensions” and “in real size” (“Is it Possible” 50). Chan et al. conclude that the virtual one-to-one scale model is a great

⁹¹ See also Carolina Cruz-Neira, “Making Virtual Reality Useful: A Report on Immersive Applications at Iowa State University.”

“tool for perceiving and simulating reality” (50). It is an upgraded version of modeling. However, at the same time, Chiu-Shui Chan et al. are aware of the challenges of full scale. They admit that, although the “change of perspective is very mobile” and “navigation through spaces” is “quick,” the virtual real-size space—being larger than the screens of the C2—“limits immediate perception to the entire site and its adjacent context and presents problems for immediately comprehending relationships among objects micro-wide” (50). For future directions, they also stress that since virtual reality enables “users to step through the computer screen into a three-dimensional artificial world,” “to further design in the artificial world, users should be able to manipulate objects naturally in the virtual space with their eyes, feet, and hands” (51).

By exploring multiple disciplines and different worldwide spatial settings, *Plowing the Dark* becomes an attempt at narrating in full scale, with “flexibility” and “mobility” of “perception” and “navigation.” Like the C2 VR environment, the fictional mix with reality in *Plowing the Dark* allows the reader to “step through” the narrative “into” multidimensional layers and a three-plot “artificial world,” full of real-world hints. *Plowing the Dark* maneuvers the immersion and non-intrusion in and out of the fictional-virtual-and-real worlds in stereoscopic manners, hence developing not only an immersive effect in the novel, but also an interactive aspect with freedom of perspective change. The reader’s interaction relies on the overload of superimposed hints, which permits a degree of freedom in the manipulation and reconstruction of the narrative. At the same time, juxtaposing the three plots—of which the two major storylines in Beirut (hostage mind) and Seattle (Cavern) converge on the Persian Gulf War story axis—troubleshoots the problems of full scale. These problems consist of limiting immediate perception of “adjacent context,” as well as “relationships among objects” and events “macro-wide.”

The plots unfold in alternation in parallel environments and sketch each environment in full scale. Then they zoom out and in to global impact, linking smart weaponry and the war in the Persian Gulf to the hostage and VR settings. Furthermore, the three plots not only offer immersion into the fictional world of literature and the real world of factual hints, they additionally render immersion into the virtual

world of technological simulations through the intensive description of the different Cavern rooms and painting reproductions along with video footage of smart weaponry. Plus, Taimur's mental imagery and thinking process in his isolation and blindfolded state surface as cognitively virtual. The narrative simulates mind processes in constant shifting between—and mixing of—reality, facts, memory, imagination, and fiction. Hence, the three-plot narrative not only simulates reality and sketches fiction and imagination in full scale, the plots mirror one another in alternation, forming (auditory, visual, and cognitive) stereoscopic effects in narration production and reception. In this respect, the novel transforms into a C2-like simulation model of narrating and implementing concept stories in full scale, which enables an interactive mode with the privilege of a mobile perspective and space navigation.

Plowing the Dark creates parallel axes of narration. The novel's structure retains complexity of space along with visual, audio, and *knowledge* detail. These elements point out the limits of vertical micro-precision and single-narrative structures. In their article "Virtual Reality and 3D Animation in Forensic Visualization," Minhua Ma et al. explore the possible use of virtual reality to reconstruct crime (homicide, terrorism, firearms, bombing, and robbery) and accident scenes, claiming that "forensic animations can reproduce the scene and demonstrate the activity and location of vehicles, objects, and involved persons at various points in time" (1227). They advance that the virtual reality animation technique can be more effective and accurate than the traditional methods of crime reconstruction namely, "traditional illustrations, photographs, and verbal descriptions" (1227). They advocate for the use of VR animation to visualize the scene for the judge and jury in court since the method "retains complex spatial information" and "high level-of-detail," and it enables access to the various viewpoints involved in the scene: e.g., "a driver's view, a victim's view, and a witness' view" (1227). Analogously, *Plowing the Dark's* multiple plot of different settings and character types imparts "high level-of-detail" and provides diverse angles to the stories at the same time. *Plowing the Dark* does not voice heads of states, generals, or leaders as much as individuals involved at the third degree—either directly or indirectly. These third-party agents have more or less

no decision-making power, including, Adie, Steve, Taimur, and Zimmerman. However, they offer various viewpoints.

A trial session of a VR HMD set was available at the Creativity Night at the Hochschule Fernsehen und Film Munich (7th of March 2020). The VR environment shows a furnished hotel room, allowing virtual walking on a one-to-one scale through the architectural space. Through a second function, the VR user, wearing the HMD and a digital hand pointer, can see the hotel lobby and reception in full scale and can swiftly move to other ground-floor locations, namely a mini-market and a gaming space. Shifting of the navigated space is facilitated by pointing a virtual laser-like marker towards the desired space via the digital hand pointer. By so doing, the viewer is free to walk in any of the modeled venues, which come in vivid colors and with extreme precision of objects and layout that simulate the space in real life.

Nonetheless, the VR environment is disorienting, with images jumping at random due to the tracking effect. Borders of space are limited or fluid, for example, one bumps easily into the virtual furniture, which bounces to a different distance when the player moves. The overwhelming immersive and full-intrusive qualities create a feeling of dizziness and loss of a sense of the outside real location. In the virtual scene, a grid appears to demarcate the end borders of the virtual space to protect the viewer from injuring themselves in the real space. In this instance, the grid comes out as an affirmation of the virtuality of the full-scale space.

The same is true in *Plowing the Dark* when the reader follows the thread of fictional elements; they also reach a grid of facts that disperses the fictional content into a whirlpool of factual accounts and hints. Concurrently, when following the factual hints, the reader could only partly connect the dots and decode the references. Powers' narratives run simulations of hybrid realities: the hints at reality do not make the novel content hold together as a whole that represents historical or scientific accounts. Instead, the connecting thread that runs through the complex events, clues, and characters leads to more connecting of the dots of logical factual connections. In turn, the act of reconstructing the logical connections of the factual clues ends up hitting a dead-end wall of fiction that fractures the connections into a pixelated narrative and resets the reader into rethinking reality, factuality, fictionality, and

virtuality. Pure connectivity and linear forward development come into question. Instead, a realization of narratives' echoes, clashing and overlapping loops, and an infinite space of blind spots takes place.

Plowing the Dark mixes historical accounts with fictional events and fictive characters, on the one hand, and brings real-world interdisciplinary discourses together with virtual reality, on the other. In consequence, the novel superimposes VR-narrative scenarios over real-world discourses in real time. Such method draws an additional link to augmented reality systems. The definition of augmented reality by Minhua Ma et al. in "Virtual Reality and 3D Animation in Forensic Visualization" clarifies that "Augmented reality is the combination of VR and real-world content where CG [computer-generated] virtual objects or humans are superimposed over real objects or into video footage in real time. An AR user may wear translucent goggles, through which he could see the real world as well as CG images projected on top of that world" ("Virtual Reality and 3D Animation" 1227). As they chart in the graph, while VR systems produce a higher level of virtuality and interactivity, augmented reality fulfills partial interactivity and mixed-reality capacities (1228). AR also ensures a higher level of immersion due to the use of "real-world elements" (1228). However, both VR and AR enable real-time interactivity within a 3D environment of multiple perspectives (1228). The mix of the virtual reality environment and real time discourses, added to the mix of fictional/non-fictional creative writing, does not occur in *Plowing the Dark* only, these techniques recur in relation to the scientific, engineering, and historical facts, present as well in the case of *Galatea 2.2*, *The Echo Maker*, and *Generosity: An Enhancement*.

6.5 Narrating in Sync

The mix of virtual/fictional content within a real-world scientific/technological/spatial context does not classify Powers' novels as part of the science-fiction tradition; rather, it positions them in hybrid virtualities. Factual exactness, mixed with a twist of fictional content, highlights that facts and precision do not always and necessarily equate non-fictionality. In "Narrating Technology," Carter Scholz considers the technologies, which comprise the AI implementations in *Galatea 2.2*

and VR capacities in *Plowing the Dark*, as neither absolutely true nor totally imaginary. Scholz insists that “[t]hough [he] called them counterfactual, neither of these notional technologies is fictitious. Powers’ prose accommodates (once might say revels in) more than superficial technical detail, and the details check out with admirable accuracy. It is in fact his fidelity to detail that renders this aspect of technological narrative visible, its tendency to derail historical thought” (301). It is important to remember that “high fidelity” to detail is also a technique employed in VR systems, called the “level of detail (LOD).”⁹² Powers’ technological futuristic discourse suspends disbelief as it is in sync with real-time laboratory experiments and scientific/technological discourses. As Scholz also argues, both *Plowing the Dark* and *Galatea 2.2* dwell on thoroughly “well-researched” contemporary “nascent” technologies (295–296). Powers’ novels reset a synthesis that brings technological and scientific breakthroughs to a middle-ground position: they tune down the excessive degrees of hype and dystopia, which are usually promoted through public reception and science fiction.

Plowing the Dark’s plots behave similarly to the mathematical function of an exponential curve, acting notions of variability, probability, and connectivity into a multiplanar and multidimensional interface of diverse disciplines, theories, and trends along with historical and cultural layers. These connect, overlap, and disconnect. They clash and converge, building on one another’s findings. Powers’ narrative plots emerge as possible samples out of many variables. The variables open the novel, and plot, up to an infinity of models that are exponential in growth, as opposed to the finite number of plots and stories that Russell Stone ponders on in *Generosity: An Enhancement*. As mostly seen in *Galatea 2.2* and *Plowing the Dark*, the creative writing system becomes a data-mining process. Powers maneuvers plot and narrative structure to renovate the novel, neither purely in literary, nor American/Western tradition. Powers’ narrative elements rework cross-cultural poetics and interdisciplines.

In his article “On Reality and Virtuality: A Study of Time-Spaces in *Plowing the Dark*,” Bradley Smith claims that the reader experiences

92 Minhua Ma et al., “Virtual Reality and 3D Animation in Forensic Visualization” (1230).

an asynchronous relationship with the plot (100–101).⁹³ For Smith, the events happen in a “separate time–space” from that of the reader, and there is discrepancy in cultural consensus (“body erasure” and “disembodied reality”) in the virtual *vis-à-vis* the real (100–101). He advances that, thereby, Powers “builds on this definition of simultaneity to establish the difference between a ‘virtual novel’—or ‘virtual art,’ a virtual experience that is unreal—and a ‘virtual reality’” (100).

Contrary to Smith’s view, Powers’ *Plowing the Dark* experiments with synchronicity and specifically with lag. Not to forget that lag, which is a “long decay time,” is a common side effect in some synchronic VR systems (Cruz-Neira, “The CAVE” 71). *Plowing the Dark*’s simulation of virtual reality acts out lapses in synchronous time. These are apparent in the lag between the storylines of the two major plots. Another interval is caused by Steve’s and Martin’s memories. The time frames of the stories, paralleled through the three-plot narrative, match with a lag that cannily fits in concurrence only at the end of the novel. The lag appears remarkably between the hostage/Cavern narratives. These come closer and converge at the Persian-Gulf-War axis: the Gulf War-Hostage Crisis and Gulf War-Cavern (i.e., they converge on the Cavern-smart weaponry line). The relation of each of the two narratives to a common axis (that of the Persian Gulf War) matches the two plots back to a point of intersection. Some of the characters also lag behind in technological skills and use. In similar ways, Powers’ novels work with synchronicity as a lag in the different modes of artificial evolution, caused by delays in keeping up with the impact of technological evolution. In Powers’ novels, literary and artistic paradigms shift in sync with technologies. Experimenting with the compatibility of literature/art and technology actualizes literary-technological synchro-clash. Within an era of fast evolving technologies, the novel faces constant still sickness, if the lag is not breached.

93 Cf. Heinz Ickstadt, “Asynchronous Messaging: The Multiple Functions of Richard Powers’ Fictions.” Ickstadt borrows the term from Powers and makes it the equivalent of “the Stereo view” (28). Ickstadt hints at the effect of asynchronous briefly, drawing on Margaret Atwood’s review of *The Echo Maker* as “jam[ming] disparate elements together” (qtd. in Ickstadt 28–29). He then explains that the effect is meant to change the reader’s awareness (29).

6.6 Plowing Algorithms in the Dark

Again, Bradley Smith's analysis suggests that, in *Plowing the Dark*, reality perforates virtuality. However, a second look at *Plowing the Dark*'s patterns reveals that the opposite is true: virtuality constantly perforates reality through the parallelism of technological–artistic evolution. *Plowing the Dark* experiments with *plowing the virtual*. Therefore, the focus is placed on virtuality rather than on, what Smith contends, reality. This starts, in the novel, with the Cavern, which embodies the virtual perforation of reality in a stereoscopic visual, auditory, and haptic environment—originating in the mind as the primal virtual immersion and the starting point for bringing the visual and palpable into shape. The novel joins in the VR parallelism, where a VR-triangular link emerges as Cavern–mind–novel. Along the exponential curve, artifacts actualize, by means of cultivating the virtual, and the virtual permeates and reshapes the real. The plowing tools and techniques evolve in the process, impacting alongside form, substance, and the understanding of the human oeuvre.

Nonetheless, *plowing* the novel's virtual narrative acts out mysterious uncontrollable disparate structures and associations in the same way “farming” codes in machine learning leads to mysterious uncontrolled algorithmic feedback. In his critique of the hype and dystopia concerning artificial intelligence, science history researcher Hallam Stevens urges a more realistic handling of the dangers of algorithms. Stevens' article “Weeding our Algorithmic Gardens” points out the increasing “incomprehensibility” of machine learning algorithmic behavior even by its makers (“Weeding our Algorithmic” 2). Hallam Stevens stresses that “algorithmic calculations are largely done in the dark,” especially when it comes to collecting and operating data; he highlights that, since these machine learning processes are “hidden from view,” they give rise to imperceptible issues due to a “lack of transparency” (3). Hallam Stevens observes a change in engineers' programming discourse that transitions due to machine learning from engineering based on “building” algorithmic architecture to “farming” loose algorithms (3). He, therefore, sounds a caution about farming “wild” algorithms that control our societies in ways IT engineers themselves do not understand (5).

Analogously, parts of the narratives in *Plowing the Dark* and in *Generosity* remain unfathomable. *Plowing the Dark's* pixilated, stereoscopic narrative in full scale sets mysterious narrative fabrications and blind spots, even with the freedom of viewpoint. Towards the end of *Plowing the Dark*, Adie accesses the Hagia Sophia virtual room and discovers that the Basilica interior has changed. It now surfaces a strange bot that not one of the team members could have possibly created. The extract reads as follows: “She [Adie] dropped her finger, shocked. The winch of code unthreaded. She fell like a startled fledging, back into the world’s snare. The mad thing swam into focus: a man, staring up at her fall, his face an awed bitmap no artist could have animated” (*Plowing the Dark* 399). The self-generated setting and bot, plus the “code unthreaded” expression, signal that the Cavern’s algorithms have become uncontrollable, manifesting a curious feature in the virtual environment that its creator, Adie, does not seem to understand or be aware of. The Cavern’s algorithms in *Plowing the Dark* turn into what Hallam Stevens defines as, the decision makers of “much of what goes behind our screens”—in incomprehensible ways (“Weeding our Algorithmic” 2).

In the case of the basilica room in the Cavern, the self-generated algorithmic decisions transcend Adie’s expectations and shock her to a virtual fall. In a series of personal interviews conducted at the Nanyang Technical University in Singapore (2019), both Bo An and Pham Quang-Cuong agreed that, in deep machine learning, the output that the machines fashion underlies a completely obscure mechanism (Personal Interview). Quang-Cuong stresses that, when a colorful pattern is placed on an individual’s T-shirt, the machine does not recognize the pattern wearer as a person; he also refers to an experiment conducted at NTU, where the machine unexpectedly identifies an airplane as a car (Personal Interview). In such instances, the processes remain unclear. Moving forward with the analysis of *Plowing the Dark*, an examination of structurally *building* the narrative follows in the next chapter. This marks a shift of focus from *plowing* the virtual narrative *in the dark* and from creating literary–technological iconoclash to producing architectural–literary iconoclash.

Chapter 7 Architectural–Literary Iconoclasm: Virtual Hagia Sophia

Plowing the Dark navigates the metaphors of virtual plowing and building through different lenses by juxtaposing the Hagia Sophia with virtual full-scale modeling in the Cavern. As seen in the previous chapter (chapter 6, part III), analysis focuses on how *Plowing the Dark*'s narrative simulates the 3D immersive structure of the CAVE. The previous chapter highlights literary–technological iconoclasm through virtual reality in narrative construction and artistic–technological iconoclasm through the evolution of image construction in artistic evolution. Like *Galatea 2.2*, where the narrative follows brain architecture via artificial neural networks, *Plowing the Dark* follows the mind's architecture in echoing both the mind's virtual reality and the CAVE's virtual reality structure. Whereas chapter 6 explores digital archiving of art via the Cavern's virtual reality design in *Plowing the Dark*, the focus in chapter 7 shifts to exploring how the Cavern creates a virtual immersive prototype of the Hagia Sophia.

Delving deep into *Plowing the Dark*'s experimental effects in narrative structure, chapter 7 (part III) focuses on the architectural structure of the narrative, highlighting Hagia Sophia's design. Here, the evolution of architecture along with the evolution of acoustics and optics—created through the chambers and the light–darkness contrast—are also explored. The fluidity and immateriality of architectural spaces and the superimposition of different structures and cultures are put into perspective, where the narrative structure follows in architectural patterns. This merges the novel's narrative structure into architectural iconoclasm in simulation of the Hagia Sophia. The focus in this chapter is thus on superimposed structures, icons, cultures, and disciplines in the form of literary–architectural iconoclasm.

Environments described in *Plowing the Dark* have a fluid spatiality. The architectural spaces come in different forms and materiality. Some are bricks and mortar, such as the Realization Lab, the hostage dark room, the Mahler Haus, and Ted Zimmerman's room. Others are

natural formations in allusion to prehistoric grottoes such as the Lascaux Caves. In other major instances, the architectural environments are mercurial in both virtuality and reality in the case of the Cavern, CAVE screens, the jungle room, the therapy room, the smart-weaponry camera screens, and the Hagia Sophia prototype. In these examples, the Hagia Sophia becomes the edifice of volatility in its physical and symbolic make-up as an iconoclastic architectural space over the course of history. The Hagia Sophia's physical and historical volatility amplifies *vis-à-vis* its virtual reproduction in the Cavern. The CAVE—as a tool for immersive and interactive architectural planning in full scale—amplifies the spatial fluidity. The play with the rigidity and versatility of architectural space is also seen in the naming of the characters: *Spiegel*, as in Steve Spiegel, means “mirror” in German; and *Zimmerman* as in Ted Zimmerman can be literally translated into “room man” from German. Besides, an intended semiotic swing, generating a free-floating multi-symbolism of the terms “cave” and “room” anchors the mercurial sense of space, inspired by the Hagia Sophia. The narrative structure of *Plowing the Dark* follows the architectural fluidity of the Hagia Sophia, imprinting iconoclasm.

In order to understand the choice of prototyping the Hagia Sophia in the Cavern in *Plowing the Dark*, it is important to examine the use of CAVE technology in the virtual recreation of historical buildings. In their “An Electronic Library for Teaching Architectural History,” Chiu-Shui Chan et al. describe the role of architectural history to render “a historical perspective of architectural forms, features, and the characteristics of spaces” (“Electronic Library” 1). They explore the shift in methods of teaching architectural history that traditionally consist of textbooks and images as well as written data on the socio-cultural influences, climate, and local materials (“Electronic Library” 1). Other basic methods also include “technology related to form generation” along with traditional two-dimensional visual material (such as: drawings, photographs, and models) capturing “color, material, texture, and shape features” of interior and exterior design (1–2). According to Chan et al., such traditional forms are not enough to offer a full-dimensional experience of the designs, which still require field trips and study abroad experience (“Electronic Library” 2).

However, the field trips cannot give a comprehensive grasp of “the original buildings” either, “because they have been ruined by time or have been remodeled or changed in some way” (“Electronic Library” 2). This gap in the lack of first-hand experience or immersive visualization of the originals—to trace the historical changes and the evolution of form, design, and optics—could be remedied by VR technology. As Chan et al. promise, the second-generation CAVE, C2, enables real-size modeling and “reconstruction of the original structure” for revolutionary teaching methods in architecture (“Electronic Library” 2). The project targets seven Western architectural historical landmarks from “seven major historical periods”: Egyptian Mortuary temple of Queen Hatshepsut, Greek Pantheon, Roman Pantheon, Romanesque Speyer Cathedral, Gothic Notre Dame Cathedral, Renaissance Tempietto, and modern Des Moines Art Center (2). By so doing, Chan et al. argue that “inside this virtual environment, buildings that existed in the past but have since been destroyed or altered can be visualized in full scale in their original form, overcoming the limitations of time and space” (“Electronic Library” 2).

Equally seen in “A Comparative Pilot Study of Historical Artifacts in a CAVE Automated Virtual Reality Environment Versus Paper-Based Artifacts,” CAVE functions as a form of digital preservation of archeological and architectural heritage from possible destruction due to natural disasters, lack of maintenance, wars, and iconoclastic practices. Sujan Shrestha et al. explain that “[i]n recent years, the technological development in virtual reality (VR) has provided an ideal platform to transform physical environments into reliable and accurate representations” (“A Comparative Pilot” n.p.). The interface is meant to develop an enhanced tool for virtual-based archiving of cultural and historical artifacts as opposed to paper-based archiving and documentation. Besides, digital preservation by means of virtual reality facilitates the study of the prototype by way of the immersive and interactive quality of the model. This study targets the UNESCO heritage of the seven monuments of Kathmandu Valley in Nepal, “destroyed in the April 2015 earthquake,” and the Temple of Bel in Palmyra, Syria, “destroyed in September 2015” (“Comparative Pilot” n.p.). Shrestha et al. remind the reader that VR systems have been used in archeology and art history and stress their

importance, just like Chan et al. However, they equally point out that VR systems are more complex in cultural and historical landmark preservation, due to the extra need for accurate and authentic information (“Comparative Pilot” n.p.).

VR interface still faces limitations of time, space, and design features. In *Plowing the Dark*, architectural archiving and prototyping in the virtual reality Cavern targets the Hagia Sophia, which is a complex architectural structure, emblematic of historical, cultural, civilizational, and natural stakes and impacts. Problems of “accuracy” and “authenticity” arise in *Plowing the Dark* at the moment of creating the Hagia Sophia VR prototype. Here, the superimposed strata of historical and civilizational changes mark the insufficiency of reconstructing the original form alone. Just as the present edifice of Hagia Sophia neither truly represents the Justinianic sixth-century architecture nor accurately displays all the past trends, a virtual original design does not capture the historical transitions, practiced on the physical matter over the different epochs that follow. Various architectural and iconic composites are absent from, changed, or added to the physical spatial entities in the distinct versions—when seen in a fixed point in time of the contrasting civilizations.

In *Plowing the Dark*, questions arise in connection to which era of the Hagia Sophia should be reproduced and preserved: the Byzantine Orthodox, Roman Catholic, second Byzantine, Ottoman, or the secular museum as a whole:

Images. Look. A thousand years of mosaics. Every few hundred years they'd fill the place, floor to dome. And every couple of centuries they'd cover them over or rip them out again.

Persistent little suckers, them they. And more than a little conflicted.

Conflicted is not the half of it. Waves of iconoclasm. Waves of repainting. It's never-ending. Worse than the abortion debate. An all-out war for our eternal souls.

So who wins finally? I've a vested interest in knowing.

It depends on where you stop the clock. Check in one century, and the walls of the church are completely gutted. Check the next, and it's your worst billboard nightmare.

Wait. You're telling me that this figure you're working on was done in the thirteenth century and this one in the ninth? There's no difference. Exactly the same style.

That's what the Byzantines would like you to believe.

But it's the Byzantines doing the ripping?

The Byzantines. The Roman Catholics. The Ottoman Turks. The modern secularists. Name your idol basher. And it's not just images. People die over this. Lots of people.

I don't see... I mean, what ... what possible difference ...?

Spiegel's lover looked up from her expressive study plates, betrayed. He should know. He shouldn't have to ask. Form mangled the truth it housed. Every fixed image crucified the divinity it tried to copy.

Adie's tone grew chill. Well. *After all. God told us not to. Burlesque skidded up against its own electric fences. The second rule He ever gave us.*

Uh, right. And remind me. What was the first one again?

We're playing with the ultimate fire here. The one true prohibition. It's like God knew that if we ever got started drawing... She trailed off, conscience-stricken, in the face of the hi-res evidence.

That?

That we'd keep at it until the picture was done. (Plowing the Dark 391)

The Hagia Sophia, or St. Sophia (Holy Wisdom)—originally a Byzantine Orthodox church built in 532–537 in Constantinople (what is now Istanbul, Turkey) under the orders of emperor Justinian I—is the emblem of iconoclasm in different complicated ways that remain partly unfathomable until today. The iconoclastic acts were performed throughout civilizational transitions but also within the same cultures. Before rising

into the Justinianic concept of the Hagia Sophia, the church in Constantinople (which had been established by emperor Constantius II in the fourth century) burned down in 404, was then reconstructed following Theodorsius II's orders in the early fifth century. The fourth-century pre-Hagia Sophia church had “common features” of “columns, curtains and a timber roof” with a “circus”-like form, as suspected (*Sophia in Context* 11). However, nothing much of Constantius' or Theodorsius' church structures remained outside of minute debatable findings reached through archeological excavations, starting only in 2004 (12).

Under emperor Justinian I, the Hagia Sophia Great Church was built on the same site in 532–537 on a completely different foundation and decorative design—with a vast interior, marble revetments, golden mosaics, a flat dome, multiple windowpanes, and semi-domes. The Justinianic St. Sophia church of 532–537 constitutes, for most scholars, the *original* prototype of the Hagia Sophia.⁹⁴ The Justinianic Hagia Sophia was the largest basilica in the world until the construction of the Seville Cathedral in Andalusia, Spain in the 16th Century. To the present day, the Hagia Sophia constitutes a source of fascinating architectural and art historical complexes that mark shifting architectural and artistic aesthetics of iconic weight, dragged in power relations of political and theological conflicts.

The original Byzantine architectural aesthetic of the Hagia Sophia is usually ascribed an aura of divine presence, highlighted in the building's interior immense vault, the floating dome, light effects from the multiple surround window glasses, light reflections in golden mosaics, and marble-covered floor and walls⁹⁵ as well as holy acoustics. The Hagia Sophia, reproduced virtually in the Cavern in *Plowing the Dark*, plays with immaterial presence via a “flight/levitation” effect of the player in the virtual “vault” (*Plowing the Dark* 392). Spiritual transcendence of “medieval monks' Ascension” in the concrete Hagia Sophia is translated into virtual buoyancy in the Cavern, with a highlight of the dome's hovering effect (392). The complex changes, modifications, and

94 Little is mentioned, or known, about the pre-Hagia Sophia church of the 4th century.

95 These views are shared by Nadine Schibille in her book *Hagia Sophia and the Byzantine Aesthetic Experience* and Bissera V. Pentcheva in her book *Hagia Sophia: Sound, Space and Spirit in Byzantium*.

additions are also converted into the digital interface. Specific design patterns are brought to light—all reworked in a shifting virtual space.

7.1 Quicksand Prototyping

Plowing the Dark recollects the different historical periods of architectural and interior iconoclasm along with the shifting aesthetics. Chapter 37 starts with the fourth-century wooden church (pre-Justinianic Hagia Sophia) and navigates through the modifications under Justinian I and beyond, reaching the Ottoman time (*Plowing the Dark* 342–343). The description of the Hagia Sophia in the novel also reflects on the marble revetment technique and symbolism (*Plowing the Dark* 342–343). Additionally, it emphasizes icon cultivation in design and mosaics from Byzantine patterns to Ottoman architectural and interior design as well as mosaic covering (342–343).

The room of holy wisdom spreads its tent beneath the dome of heaven.

Wood will not do, for its wooden parent burned. The building draws its stone from the farthest throws of the empire. [...]

It steals its palette of marble from the whole spectrum of imperial provinces: pink from Phrygia, Lydian gold, ivory Cappadocian, green from Thesselia, pure white quarries of sea-girt Proconnesus. Cut and dressed, the stone veins fan out to meet their mirror shapes at each facing's joint, picking up and echoing, like a stilled kaleidoscope, hints to heavenly device and earthly emblem, painted incantations, living creatures bolting through the symbolized undergrowth.

The floor plan is a daring cross [...]. And soaring above all, the dome rises to its awful altitude, climbing upward not to a point but cupped like the gentle firmament itself, a helmet resting on air [...] (*Plowing the Dark* 342)

The “original” Justinianic Hagia Sophia structure remains erect until today as it has been restored since the Hagia Sophia became a museum

in 1935.⁹⁶ Still, the original make-up has undergone many changes, renovations, reconstructions, and demolitions in acts of iconoclasm and/or iconoclasm. In its current museum function, the Hagia Sophia is not a total reconstruction of the Byzantine church, although the mosque minarets that had been added under the Ottoman era were removed for the sake of restoring the monument to its sixth-century state. The museum still captures iconoclastic presence, immediately visible in the superimposed religious icons as well as a mix of Ottoman and Byzantine interior decor. Away from striking arrangements, many more iconoclastic and iconoclasm elements are revealed by experts from the fields of art history, history, archeology, and architecture. Iconoclastic alterations in the Hagia Sophia were not only conducted following the fall of Byzantine Constantinople under the Ottoman conquest and the change of the church into a mosque. In fact, iconoclastic practices were equally executed under the different Byzantine emperors and under the Roman Catholic invasion of Constantinople as well.

Byzantium witnessed an oscillation between iconoclast and iconophile Christian emperors, marking two eras of Iconoclast Byzantium and a wave of conflictual discourses and verdicts concerning the symbolism and the role of the image as an icon, as seen in Jaś Elsner's account.⁹⁷ Then the Fourth Crusade usurped Constantinople and converted St. Sophia from a Byzantine Orthodox church into Roman Catholic faith from 1204 through 1261 (*Sophia in Context* 1). Having recuperated the city thereafter, the Byzantine emperor Michael VIII Palaeologos re-established the basilica of St. Sophia into the Byzantine Orthodox and Patriarchal order again until 1453, when it was next transformed into a mosque, following the commands of Sultan Mehmet II as the city succumbed to the Ottoman Empire (*Sophia in Context* 1). Under Kemal Atatürk's secular regime, the Hagia Sophia was resolved into a secular museum, open to tourists and research from February 1,

96 In their book, *Hagia Sophia in Context*, Ken Dark and Jan Kosteneć argue that, while the church building itself still figures in its 6th century design, "the situation is far more complicated" because of "later Byzantine" modifications and "additions" that are "underestimated." The authors also point out the changes adopted during the Ottoman reign and restorations under the secular Turkish republic (*Hagia Sophia in Context* 1–2).

97 Jaś Elsner's "Iconoclasm as Discourse: From Antiquity to Byzantium."

1935 to July 2020 (*Sophia in Context* 1), and embracing some of the different cultural and civilizational impacts throughout the historical trends.⁹⁸ The transformations under the here-traced different regimes and empires affected architectural structures, relics, and mosaics in terms of construction, destruction, and change as well as additions, reconstructions, covering, and vandalism.

The passage in *Plowing the Dark*, cited in the beginning of this chapter, articulates the curious “never-ending” “Waves of iconoclasm. Waves of repainting” “And more than a little conflicted” with parading “idol bashers,” and icon restoration as “Images [...] A thousand years of mosaics. Every few hundred years they’d fill the place, floor to dome. And every couple of centuries they’d cover them over or rip them out again” (*Plowing the Dark* 391). The different epochs and transformations of the Hagia Sophia’s architectural structures and interior accessories make the virtual recreation of the prototype an extremely complex endeavor that the novel draws to attention through the Cavern. In *Plowing the Dark*, the prototype is not transfixed in time, but it is an act of either a choice of one period over the other or a recreation of the different transitions, highlighting the non-fixed and non-static aspect of the referent and its components.

Adie explains to Steve that the outcome of the fluctuating trends of iconoclasm in the Hagia Sophia “depends on where you stop the clock. Check in one century, and the walls of the church are completely gutted. Check the next, and it’s your worst billboard nightmare” (*Plowing the Dark* 391). The dilemma, presented in the Cavern in *Plowing the Dark*, questions the limitations of original or segment representation in possibly causing unauthentic archiving of monumental constructs in the sense of an incomplete, or biased portrayal that could lead to a lack of historical accuracy. In turn, incomplete prototyping exerts civilizational and cultural misrepresentation, in this case, due to the complexity of the superimposed cultural strata and icon clashing. Not to forget that

98 In July 2020, the Hagia Sophia was turned into a mosque, which provoked national and international debate.

natural destructions, due to earthquakes, have also taken their toll on the structural changes in the Hagia Sophia.⁹⁹

Steve points out the impasse by asking Adie: “So where does that leave us? I mean, we have a millennium and a half of possible interiors, ranging from figure-clogged to buck naked. Which moment are we supposed to re-create? / She held her mouse up to her chest, a numbed virgin holding up her child victim for target practice again. That’s the only question” (*Plowing the Dark* 392). The attempt to virtually model the Hagia Sophia, in *Plowing the Dark*, sheds light on the problematic aspects of the goal and shifts the focus of prototyping and preserving to exposing iconoclastic complexes. The Cavern—and the novel indirectly—turn into a project of replicating an external physical iconoclastic environment into an immersive iconoclastic virtual environment, with regards to diachronic civilizational influences and changes. As a result, the novel captures the controversy of “impasse” and “*longue durée*” approach versus “over-explanation” and “*courte durée*” approach in history and art history (a controversy, which Jaś Elsner deals with).

In parallel with the VR prototyping of the Hagia Sophia, *Plowing the Dark* traces the evolution of art from conflicting trends of representation and self-reflexivity. It hints back at antique and early classical Hellenic philosophy, and not only to the Early Christological debate over the image—in some similar ways to Elsner’s approach. However, *Plowing the Dark* transcends Elsner’s *longue durée* by reaching out to the pre-historic Lascaux cave drawings, marking them as the possible origin of art and image cultivation.¹⁰⁰ The narrative fast forwards from Upper-Paleolithic cave drawings to Plato’s allegory, then to the Hagia Sophia and samples of different painting trends and aesthetics up until their virtual reconstruction in the Cavern. Prototyped in the Cavern virtual reality environment, these trace the evolution of image

99 The basilica underwent several earthquakes in August 553 and December 557 causing some damage to the structure and the collapse of the main dome in the May earthquake of 558. Still, under the rule of Justinian, Isidorus the Younger (the son of the original co-designer of the Hagia Sophia, Isidorus of Miletus) restored the dome and repaired the church damage by December 562 (*Hagia Sophia in Context* 2).

100 For a full study on the birth of art in the Lascaux caves, see Georges Bataille, *Lascaux or the Birth of Art*.

discourses that zigzag through the different disciplines: art, philosophy, theology, archeology, architecture, optics, acoustics, geometry, and mathematics—along with literary, political, and military channels.

Adie finally constructs a secular comprehensive version of the Hagia Sophia in the virtual environment, only to end up ripping it off.

Adie insisted on including every flourish: the Theotokos, hovering in the eastern apse; the Deesis, harsh in its second-story south gallery. A single overarching volume arose from her anthology of parts. But her flight toward sanctuary played out as the most secular of footraces: her push for transcendent detail versus spring's public demo deadline.

She labored for longer than she could afford over each tile in the southwest narthex tympanum: Justinian and Constantine presenting the church and the city to the seated Christ. Each mosaic emperor held up his gift of a scale mosaic model: tiny domed cosmos inside the tiny domed cosmos they decorated.

Stevie watched her work, excited by the stillness that consumed her. So this is the dream of VR? He asked. Be of the world...? (*Plowing the Dark* 392–393)

Steve continues the conversation, offering an approximation of virtual structures that are as breakable as the real-world structures of the Hagia Sophia are: “*You know what we need? [...] Code that will crumble at the same rate as mortar does. Stone that compresses. Joints that break. Bits of rubble that accumulate around the piers after the simulation has been running for a few hundred years. Rubble that no one actually programmed...*” (*Plowing* 393). With Steve’s proposal, the programming of the virtual Hagia Sophia aspires to recreate the trends of iconoclasm, possibly through machine learning algorithms (see part III, chapter 6, section 6.6. “*Plowing Algorithms in the Dark*”).

Towards the end of the novel, the Cavern model of the Hagia Sophia undergoes virtual iconoclastic measures. Following her feelings of guilt over the smart weaponry deployed in the Persian Gulf War, Adie proceeds to demolish all the Cavern rooms and their backup copies that she had realized, marking contemporary iconoclasm as digital. Adie’s ethi-

cal resentment of the instrumental use of VR in war weaponry expands the iconoclastic trend into nonreligious association. Adie destroys all of the codes she produced, leaving parts of those that were made in collaboration intact—as if to enact the act of iconoclasm in its remaining reminders.

She destroyed the backup copies first. That much she'd learned, in her years of becoming digital. One by one, she mounted the archived volumes. And file, directory by directory, she erased her handiwork. It was not much, this retaliatory strike. It did not answer to what had been done. But in her own small way, Adie vowed to kill what she could.

[...] She tore up her Arlesian floorboards but left behind Raj's ethereal creaking. She torched her dreamworld jungle, sparing those bits of vegetation that Karl had nurtured [...]. (*Plowing* 398–399)

In a way to save the world from smart weapons—amplified by possibly keeping the Hagia Sophia intact—the act of iconoclasm swings at the edge of iconoclasm. The same hand (Adie's) that created the VR environment proceeds to rip it off. Performed on the virtual space, this iconoclasm does not leave marks on the physical structures but on the virtual project as a whole. Although Adie attempts to abort the Hagia Sophia virtual edifice, the chapter ends in an unclear way in terms of whether the VR prototype was indeed destroyed. As Adie accesses the Hagia Sophia VR room, she hovers unwillingly in the virtual “vacuum” of “the nave's great hollow” towards the dome. The virtual prototype now displays Ottoman patterns in the dome, “She booted up the cathedral and stepped back in. [...] She let herself rise into the hemisphere apse, then farther up, all the way into the uppermost dome, now inscribed with its flowing surah from the Qur'an” (*Plowing the Dark* 399). In the virtual environment, iconoclastic action is self-enacted via AI systems. At the end of the chapter, Adie falls in shock at the mysterious appearance of self-generated algorithmic function (399), leaving the reader uncertain as to whether she continued the destruction of the VR Hagia Sophia. The last scene of the VR Hagia Sophia displays a shift of the icon from image into script, which is, in turn, cultivated and (ab)used

for terrorism in the case of the captors of Taimur in the Lebanon narrative plot. The novel reflects how the discourses on the image as icon, and its controversial performative power, continue and develop into virtual reality prototyping.

In the Cavern, the icon is a digital function; and in the smart bombing weaponry, the image is absolutely performative. Icon cultivation continues to swing between representation, self-representation, and performativity in an artistic, theological, secular, literary, technological, and military framework. Recreating complex physical structures, like the Hagia Sophia, in three-dimensional immersive one-to-one scale constitutes a form of historical as well as vertical and horizontal navigation of space. However, the Cavern may inhibit a general view of juxtaposed elements, as seen in Chan et al.'s full-scale VR design systems. Virtual distortions exert a vertical type of iconoclasm to space in the illusion of a whole-world entity that dismisses the uniqueness of space (see Toscano and Kinkle; Hito Steyerl). Scaling and re-scaling, along with mapping and re-mapping, are forms of iconoclasm and iconoclasm, which are enacted by satellite and space technologies in the trend of God's eye view and free fall (see Toscano and Kinkle; Hito Steyerl).

On the one hand, the mortar of the Hagia Sophia is modeled into 3D pixels in the cyberspace of the Cavern, dissolving the material into immaterial. Here, the virtual reproduces the physical in the illusion of full-scale, total experience and of comprehensive horizontal perception that remains virtual. In addition, the Cavern's reproduction of the Hagia Sophia includes all historical design elements. Moreover, through the flight option, the Hagia Sophia VR room also grants the user a vertical God's eye view of the Basilica. On the other hand, Baghdad is transformed into sand bits dismantled in a fusion of digital and real dimensions under smart-bombing screens: "Babylon became a bitmap. Pilots took its sand grains apart, pixel by pixel, their soldier bodies tied to weapons systems by electronic umbilical, their every joystick twitch duplicating moves overlearned in years of now-consummated simulation" (*Plowing the Dark* 395). In this scenario, the virtual—producing a copy of the physical—perforates the real space in direct physical iconoclastic re-mapping and re-scaling that is oblivious to cultural and civilizational heritage. Connected to the Hagia Sophia prototyping and art

archiving, but at the same time, used in smart bombing by military interventions, the VR space in *Plowing the Dark* acquires an iconoclasm stance of double purpose in cultural heritage preservation and destruction.

7.2 Superimposed Narrative Structures

Like the literary–technological iconoclasm in the form of stereoscopic surround narrative structure, the narrative in *Plowing the Dark* takes the shape of narrative–architectural iconoclasm. VR modeling in the Cavern—in Adie’s secular comprehensive method—validates the stratified structure of the physical edifice. By so doing, the novel’s narrative performs the superimposed iconic and structural layers of the Hagia Sophia. The novel’s multilayered construct is also amplified through intercultural, interdisciplinary stratification.

Symbolically speaking, as referred to in the novel, Baghdad stands for “Babylon” and, therefore, for the possible notion of the cradle of civilizations. The juxtaposition of hints at the Hagia Sophia and Babylon, with the inferred mosaic configurations, may also constitute a hint at the origin of mosaics. In *The Short Story of Architecture*, Susie Hodge traces back the origin of mosaics to a pagan temple in Tell Al-‘Ubaid in Mesopotamia (204). These mosaics, made in the second half of the third millennium BCE, consisted of “stones, shells and ivory” (204). According to Hodge, mosaics then spread among ancient Greece and Rome—where the Romans used the technique to create ground and mural pictures made of colored “glass tesserae”—and became a common decorating motif in Christian and Byzantine basilicas starting from the fourth century (204). Tracing the origin of mosaic aesthetic reveals civilizational layers of aesthetic influence. Analogously, the Hagia Sophia Great Church—erected as the Byzantine House of Wisdom in Constantinople—creates parallelism to the House of Wisdom in Baghdad (بيت الحكمة, *Bayt al-Hikmah*), founded during the era known as the Golden Muslim Age in the Middle Ages as the Grand Library emblem of interdisciplinary and intercultural knowledge exchange, translation, and production.¹⁰¹ Multiple shifts in the civilizational make-up mark

101 See also part II, chapter 4, 4.1 “Micro-Demarcations.”

the fluidity of knowledge preservation and intercultural, interdisciplinary influence, leading to layers of civilizational superimposition in the forms of iconoclasm and iconoclasm.

Going back to ancient history and in connection to the development of architectural space, the Cavern traces the possible evolution of architecture—like art—from the cave in cave dwelling forms to physical brick and mortar, then VR constructions via CAVE. In his book *Rewiring the Real*, Mark C. Taylor reminds the reader that “[p]hilosophy, religion, and art began in a cave” (78). In the same logic, architecture emerges from caves. A second look at Plato’s allegory reveals that the cave is portrayed as a space of imprisonment. In *Plowing the Dark*, Taimur’s solitary confinement room is at times described in cave-like dimensions. Furthermore, some links between architectural space and caves may be seen in different concrete models that are not mentioned in the novel. These advance the idea of cave-architecture evolution. In Matmata and Tataouine, Tunisia, many Amazigh houses are originally constructed as elaborate holes carved into the ground or into mountains with connecting chambers. Cave dwellings, dug laterally, reveal “alterations of limestone, clay, marl and dolomite strata” (Boukhchim et al. 575). Some of the houses are built on top of the ground in a clay material. A few ruin sites of complete clay-village compounds as well as samples of inhabited cave homes are still seen, for instance, in the southeast region of Tunisia.¹⁰² Some contemporary architects play with the cave-like design and experiment with it in modern projects. Architect Balkrishna Vithaldas Doshi designed an underground art gallery in India in the shape of a cave formation, with multiple domes (Exhibition at Pinakothek der Moderne, Munich, 19 Jan. 2020).¹⁰³

Another example is a landmark of eco-friendly architecture at Nanyang Technological University in Singapore, which is the Learning Hub South—The Hive, designed by architect Thomas Heatherwick.

102 See Nouri Boukhchim et al., “Lateral and ‘Vertico-Lateral’ Cave Dwellings in Haddej and Guermessa: Characteristic Geocultural Heritage of Southeast Tunisia.” The research is interdisciplinary, “crossing geomorphological and historical/architectonical approaches”—as the authors explain (575).

103 “Balkrishna Doshi: Architecture for the People,” Pinakothek der Moderne, Munich, Germany, 17 Oct. 2019–19 Jan. 2020.

Although it was intentionally planned to look like a beehive, strolling inside the concrete building feels like walking inside a multi-chambered cave, with several openings. Within the tropical climate, The Hive demonstrates energy efficient materials and shapes, enhanced with innovative techniques of vertical gardening that keep the space cooled (“Ecocampus” n.p.). Based on sustainability, these aspects embed the Hub center into the future of Singapore’s architecture. On the other hand, the architectural spaces in *Plowing the Dark* evolve from cave patterns to CAVE structures. These are highlighted in recurrent physical and virtual domes, fluid interiors, and dark/light contrasts. Therefore, in the novel, the future of space is embedded in the virtual reality CAVE. Powers’ novel is crafted in a composition of superimposed layers of cultural heritage, historical accounts, aesthetic patterns, artistic movements, hybrid identities, and diverse disciplines. The narrative’s stratified elements in *Plowing the Dark*—also recurring in *Galatea 2.2* and *Generosity*—appear as iconoclasm. It is not clear whether the act of bringing such clashing elements together constitutes an act of destruction or construction. This is valid for the mix of disciplines, and different disciplinary trends, and theories within the novels. The next sub-chapter, therefore, examines details of optics and acoustics, which are responsible for architectural volatility.

7.3 Architectural Volatility: Evolution of Optics and Acoustics

[Steve] Spiegel worked on the code that would move the pilgrim through so much sculpted emptiness. He turned the visiting body into its own joystick [...]. On raised index finger swept the visitor off the floor up into the soaring vaults.

[...] Spiegel succumbed to the euphoria of flight. Here was the levitation all children dream of, the easy uplift of birds that the soul feels entitled to, brought weightlessly to life. He pointed his digit skyward. The ground fell away. The upper arcades drew close. He hovered in place, twenty meters

above the church floor, drafting on the currentless air like one of those miraculous medieval monks who repeat the Ascension on faith alone. (*Plowing the Dark* 392; [my additions, my omissions])

Examining the architecture and interior design of the Hagia Sophia reveals characteristic spatial optics, acoustics, and fluidity—which are accentuated in VR. In *Plowing the Dark*, the evolution of optics (in art, philosophy, and architecture) may be traced back to Plato’s allegory. Here comes the illusion of human presence by means of fire, darkness, and shadows in the grottoes. In the Hagia Sophia, optical illusion is generated by means of the multiple windows around the flat dome. The light beams trick the mind into a floating dome impression. Hence, the option to include the Hagia Sophia as VR prototype in the Cavern’s immersive environment stresses a stance of virtuality in its architectural structures. These, in turn, connote the evolution of optics and fluid spaces. This comes hand in hand with an evolution of acoustics, as portrayed by Bissera V. Pentcheva in her book, *Hagia Sophia: Sound, Space, and Spirit in Byzantium*. Here, iconoclasm and iconoclash of the different forms: pictorial, architectural, acoustic, and optical intermix with a notion of evolution.

7.3.1 The Evolution of Optics

Before examining the optical configurations in the Hagia Sophia, a brief look at optics in Plato’s allegory brings further insights into the novel’s dimensions. In *Rewiring the Real*, Taylor misses the importance of fire in creating the shadows in Plato’s cave allegory (*Rewiring* 78). The element of VR in its primitive form is a projection of a source of light through darkness on physical matter.¹⁰⁴ In the case of the allegory, the shadows appear as the fire light is projected on the enslaved people. However, Taylor deems the allegory to highlight clarity of vision, through distinction between the projection and the “substance of reality” (78). With the interactive, immersive effect of the Cavern, the distinction grows less and less possible in *Plowing the Dark*. A sense of

104 See Alhazen’s experiments that led to the creation of the camera obscura.

plowing the dark is repetitively suggested in the novel—apart from plowing algorithms—through the obscure opacity which is doubled with the blindfolds in the hostage room, through the HMD set in the Cavern, and through the camera-guided smart bombs.

Going back to the example of the Hagia Sophia and to the sixth century: Anthemius of Tralles, the Greek-Byzantine mathematician and engineer, who co-designed the Hagia Sophia, was supposedly well versed in the field of optics as well.¹⁰⁵ The windows of the Hagia Sophia give the dome a sense of hovering that can be associated with an architectural virtual reality effect. The effects of light coming into the building at the different times of day (of dusk and dawn) play with the optics of materiality inside (*Hagia Sophia: Sound 2*). In her book, *Hagia Sophia: Sound, Space, and Spirit in Byzantium*, art historian Bissera V. Pentcheva describes the light effects on the inner architecture of Hagia Sophia, based on a 1930s–1960s account as follows:

Still to this day, at dusk and dawn the light in Hagia Sophia penetrates and illuminates the interior in segments, gliding across the surface of walls covered in marble slabs and gold. The sun's ray catch on the carved stone frames of the revetments and transform the marble into incandescent matter, making it appear as liquid rather than solid. Similarly, the slabs of marble consuming the light of sunrise present a warm fleshlike surface, as if the sun were performing a metamorphosis, turning stone into living body. (*Hagia Sophia: Sound 2*)

Pentcheva calls this impact of light “transformative vision” (2), or “liquescent aesthetic” (11). These terms will represent the backbone of my analysis of space in *Plowing the Dark* in this section. Pentcheva adds that, “[a] ring of windows at the drum conveys a sense of lightness, as if the masonry cupola hangs suspended on a chain from heaven” (3). This

105 The designers of the Hagia Sophia were supposedly Anthemius of Tralles and Isidore of Miletus. As Pentcheva explains, their function was “*mechanikoi*,” which at that time was an umbrella of expertise in physics, mathematics, astronomy, and engineering. Training in such a field was connected in importance to the City of Alexandria, Egypt (*Hagia Sophia: Sound 113*). The design of the Hagia Sophia's flat dome could be associated with the specialization of its engineers in optics (*Hagia Sophia: Sound 113*).

effect of “transformative vision” is clearly captured in two pictures at the beginning of Pentcheva’s book. The black-and-white image of the Hagia Sophia’s interior, accompanying the title page, shows sunrays beaming through the windowpanes in different layers of light streams, diverging downwards diagonally from the lower windows, and tilted horizontally from the upper dome windows. Figure 2 of the Hagia Sophia interior (*Hagia Sophia: Sound 4*) shows in colors sunray, gleaming from the opposite side, announcing a different time of day, and casting long shadows of the hanging chandeliers down on the marble floor. The two photos capture the sense of the floating dome due to the light beams, enabled through the surround windows.

7.3.2 Artificial Reflections

In her book, *Hagia Sophia: Sound, Space, and Spirit in Byzantium*, and also in the video, *The Voice of Hagia Sophia*, Pentcheva establishes a link to the metaphysical impression between the fluidity of optics and sound, and the volatility of the architectural surfaces in the Constantinople Great Church. For this, she explores details of the marble patterns and techniques of the Hagia Sophia to support her theory on “material flux” (121).

Pentcheva suggests that the surface of Proconnesian marble is an imitation of the surface of water, and elaborates that the marble’s exposure to the changing daylight in the Hagia Sophia reflects “glitter” waves that cause an impression of “liquidity” in architectural solid surfaces (*Hagia Sophia: Sound 122; The Voice of Hagia Sophia*). In this respect, she plays with the common Greek root “marmar-” in the term “marble” (“marmaron”) and “glitter” (“marmarygma”)(*Hagia Sophia: Sound 121–122; The Voice of Hagia Sophia*). She highlights the echo of marble to shimmering sea surface by attributing this “marmar-aesthetic of water” to a “Greek-speaking Mediterranean” tradition (*Hagia Sophia: Sound 128*). In addition, Pentcheva considers that the technique of carefully matching the marble slabs in the interior revetment enhances the mirroring effect of the surface and therefore the “material flux” (*Hagia Sophia: Sound 140–141*). The liquescent material flow, in turn, creates a “chameleonic” effect, as she puts it (121).

Optic reflections and symmetric aesthetics of the Hagia Sophia are, according to Pentcheva, embedded in the chiasmic format (i.e., “inverted parallelism”) of poetry (*Hagia Sophia: Sound* 85).¹⁰⁶ The inverted parallelism structure is apparent in the Byzantine chants that were performed in the liturgy of the Hagia Sophia (78; 85). When chanted by the choir under the cupola, “the chiasmic form,” “antiphonal” recital, and “aspiratory sound” produce disparate feedback of aural reverberations (32; 78; 116). These give the building a “reactive voice” embedded in the “call-and-response structure of the psalmody” and the reverberant architectural space due to the domes and marble (116). The chiasm reflects heavenly and worldly essence and creates an effect of elevation and floating in divine presence, as she argues (87; 116). A deep connection between the visual and the sonic is, therefore, established (6). Pentcheva uses the term “glitter” in optics as counterpart to “reverberations” in acoustics. By so doing, she argues that both phenomena are complementary in the immersive and interactive spiritual experience of the Hagia Sophia (*Hagia Sophia: Sound* 122; *The Voice of Hagia Sophia*).

7.3.3 Artificial Reverberations

Pentcheva explores a similar effect in acoustics, which is also highlighted in the novel. She explains that:

Hagia Sophia’s vast marble-revetted interior quickly mixes the reflected sound energy, especially at the wavelengths in the range of the human voice. It stays full and well mixed for a reverberation time upwards of ten seconds. The dome and semidomes contribute to the production of an enveloping sound as they redirect and scatter the sound energy. (*Hagia Sophia: Sound* 12)

¹⁰⁶ Pentcheva defines chiasm in literature as “the repetition of a word or a phrase in a mirroring structure that establishes a frame arranged centripetally about a center” (85). As she remarks, chiasm is used in many texts like Homer, but also the Old and New Testaments as well as the Gospel of John (ibid.). For Pentcheva, the use of chiasm in text produces “Pneuma” and places man in the center (ibid.).

The resonance equates to immersive exposure, based on what Pentcheva perceives as a “multisensory” experience of “architectural aurality” (5). To stress the uniqueness of the Hagia Sophia’s immersive sound effects, Pentcheva distinguishes between echo and reverberation:

In common parlance ‘reverberation’ is a synonym of ‘echo,’ but in terms of acoustics, the two mark different physical phenomena. Echo is a series of distinct returns or partial repetitions of the original sounds due to reflection off a distant surface [...] By contrast, ‘reverberation’ is used by acousticians to identify the residual sound energy that accumulates in an enclosed space from a collection of reflections from surfaces after an original sound has been fired. These sonic reflections arrive by the millions, densely compacted in time, each with minimal loudness and thus inaudible by itself; yet as a group they build what acousticians consider the reverberation of space. Long reverberation is the by-product of any large enclosed space whose walls, ceiling, and floor are faced with highly reflective surfaces. (100)

Hagia Sophia’s acoustics becomes a characteristic feature that Pentcheva experiments with and reworks into other architectural spaces. She elaborates that, at the 2011 Stanford project of Icons of Sound, a digital recreation of the reverberation acoustics of the Hagia Sophia was made via the technique of “convolution” (*Hagia Sophia: Sound* 106). Convolution is “an algorithm that imprints the impulse response (acoustic signature) of the space being modeled onto an input audio signal, which can be a recording or live sound” (99). Artificial reverberations were imprinted on live performance (inside a music hall in the United States, the Bing Hall, Stanford University) in an attempt to give the contemporary audience the impression as if they were witnessing Byzantine chant of the Hagia Sophia’s Eucharist inside its original Justinianic Orthodox state from 532–537 (*Hagia Sophia: Sound* 106; 108). Pentcheva stresses that “artificial reverberation” enacted the sonic interactivity between the choir, Cappella Romana, and Hagia Sophia’s resonant acoustics via “real-time feedback” (106). She explains that “[a]s a result, the choristers dramatically slowed their tempo. They also adjusted their pitch to activate the high-frequency resonances sustained by the building” (106).

This live feedback technology is developed after the Virtual Acoustics Technology (VAT) (107).¹⁰⁷ The VAT system digitally reproduces live acoustic feedback from a different building; hence, it acoustically transports the performers to interact with that distinct aural effect as if in the original space (107).

The 3D audio technique changes the aurality of a given building by enhancing the current architectural space with the desired acoustics of another place. In this respect, the virtually augmented sound effects are meant to breach the rigid architectural solid contours and transform them into malleable environments. Pentcheva describes the processes of the live auralization of Byzantine chant at Bing Concert Hall as follows:

In this auralization, the direct sound and early decay time is that of the Bing. But the late field reverberation is that of the Hagia Sophia; it is played by loudspeakers placed in the hall, which transmit the voices of the choristers converted into digital signal and convolved with Hagia Sophia's late field reverb. (*Hagia Sophia: Sound* 107)

Pentcheva continues that, by means of the overlap of the dual effect, “the live auralization created a hybrid environment of direct sound produced by the concert hall but imprinted with the late field reverberation of the imagined and unseen vastness of the Hagia Sophia” (107). Here, Pentcheva distinguishes between virtual reality and “augmented space” in the degrees of immersiveness.¹⁰⁸ Whereas she deems the first to be embedded in “full immersion,” for her “augmented space never fully releases its hold on reality,” and by so doing, it generates “multi-dimensional space” (*Hagia Sophia: Sound* 107–108). The technique marks an evolution in sound production from “natural” reverberations, via dome and marble surround effects in the case of the Hagia Sophia, to artificial reverberations, simulated through virtual acoustics, independently from solid architectural spaces. Architectural structures in the medieval ages had the functions of technology, as sound ampli-

¹⁰⁷ Virtual Acoustics Technology (VAT) was created by Wieslaw Woszczyk (*Hagia Sophia: Sound* 107).

¹⁰⁸ The term “augmented space” was coined by Lev Manovich to describe such hybrid acoustic environments (qtd. in *Hagia Sophia: Sound* 107).

fiers, which is no longer the case in modern architecture. As Pentcheva argues, modern acoustics, starting with the early twentieth century, has witnessed intentional elimination of reverberations, considered since then as noise (109).

Pentcheva's study shows that the evolution of acoustics goes hand in hand with an evolution in architectural size, shape, and interior material, on the one hand, and the purposes of the architectural space, on the other. As she reveals, modern age favors clear speech, or musical instruments—with the help of microphones and loudspeakers—over humming antiphonal chants through vast void spaces (*Hagia Sophia: Sound* 109). In this respect, although she takes into consideration the open debate about the intentionality of medieval acoustics, Pentcheva believes that modern acoustics severs from the architectural “alive” responses of sound, by “flattening” them into “dry,” neutral spaces through reverberation camouflage materials that help absorb the unwanted resonant feedback (109). Virtual acoustics technology mediates both methods and transcends time and space as it enables the recuperation of older forms of acoustic effects within modern spaces—albeit via algorithms—hence allowing the archiving of acoustics along with experimenting with them. Such VR systems become an alive form of archiving that amplifies interaction and co-existence in superimposed layers of the virtual over the real.

7.3.4 Liquescent Narrative Structure

Pentcheva calls the liquid effect—caused by reverberations and glitter—aural and visual “liquescence” (*Hagia Sophia: Sound* 121; *The Voice of Hagia Sophia*). In the case of the Hagia Sophia, optics and sound were supposedly meant to merge and offer an immersive and interactive spiritual effect that gives a sensation of elevation. In *Plowing the Dark*, Pentcheva's elements recur. The description of the interior of the Hagia Sophia, in the novel, matches her theories and imprints the narrative structure with similar liquescent flux, enhanced through the virtual reality Cavern.

Plowing the Dark's architectural spaces coordinate with the “liquescence” of Hagia Sophia's interior. They appear as fluid spaces and struc-

tures, matching, in turn, the immaterial virtuality of the Cavern. The liquid character of the Proconnesus marble surface, which Pentcheva studies in detail, figures in *Plowing the Dark* as “pure quarries of seagirt Proconnesus” in chapter 37 (*Plowing the Dark* 342). This reminds us of Pentcheva’s study of the water-like effect in connection to sea-like glitter in the *marmar*-aesthetics. In addition, this chapter in the novel thoroughly describes the structural elements of the Basilica. Here, Hagia Sophia’s book-matched marble slabs are stressed, highlighting the symmetrical and refracting optical aesthetics that combine divine and worldly double reference: “Cut and dressed, the [marble] stone veins fan out to meet their mirror shapes at each facing’s joint, picking up and echoing like a stilled kaleidoscope, hints to heavenly device and earthly emblem, painted incantations, living creatures bolting through the symbolized undergrowth” (*Plowing the Dark* 342). Steve Spiegel’s last name, meaning “mirror,” accentuates the refracting connotation of the marble, and the dynamics of optics. In turn, liquid refractions in marble stones shed light on the transformations in the techniques, symbolism, aesthetics, and functions of mirroring—in “kaleidoscopic” manner.

To push this metaphor further, kaleidoscopic mirroring accumulates through the different forms of representational, self-reflexive, and non-representational art tracked in the novel, on the one hand. On the other hand, the novel is full of multiple reproductions and reconstructions in the form of the VR recreation of the Hagia Sophia, Van Gogh’s *The Bedroom*, and Lascaux Cave paintings—which are all already reproduced, recreated, and reconstructed in the first model and beyond in multiple originals, cheap reproductions, and preservation techniques.¹⁰⁹ These underscore a chain effect of infinite reproduction and point out problematic notions such as original, origin, cheap copies, prototype, virtual copy, digital modeling, as well as preservation—which are all

109 This is amplified through the reference to Marcel Duchamp. As Dario Gamboni puts it in “Image to Destroy, Indestructible Image,” Duchamp’s “Readymades” is an attack on art and artists as “anti-art,” exposing the art/the ready-made complexity (110–112). Furthermore, in his *Simulacra and Simulation*, Baudrillard refers to “the exact replica” of the Lascaux caves, which are meant to preserve the original caves by offering tourists the possibility to visit the whole thing in replica instead of the original (9). For Baudrillard, the “duplication suffices to render both artificial,” therefore, the Lascaux caves become simulacra (9). In this respect, *Plowing the Dark* renders a simulacrum of the simulacrum in the CAVE.

recurrent motifs in the novel.¹¹⁰ The kaleidoscopic effect also resides in sound reverberations, light refractions, and iconic images in the VR Hagia Sophia. Analogously, the Cavern lends the novel (and the VR environment) to infinite “mirroring refractions” and “reverberating reverberations.” The Cavern, therefore, creates a sort of self-reflexive simulacra that is multidimensional, immersive, and interactive. The novel creates simulacra of the simulacra through the CAVE.

The VR Cavern functions like an oxymoron of “one continuous chasm,” which reads in the passage below as a possible reference to chiasmic structure (*Plowing the Dark* 400). As the rooms in the novel occur as loose spatial and temporal dimensions, opening themselves to a volatile “chameleonic” flow, the novel follows in structure. Chapter 43 in *Plowing the Dark* announces:

The room of the Cave is one continuous chasm.

Its chambers all connect. They run together, the way old Greek was written: no space, no commas, no periods, just one long flow without dams or rapids, a single subterranean stream that never changes its course. But never the same stream twice. (400)

As seen in the passage above, the virtual reality Cavern takes a liquid form that regenerates, highlighting both visual and sonic flux; “just one long flow” and “never the same stream twice” like the reverberation feedback. In multidimensional chameleonic reflexivity, *Plowing the Dark’s* narrative refracts kaleidoscopic waves of artifacts in the fluid rooms of virtual reality. The narrative reproduces optic volatility of solid environments and imprints them with virtuality.

Kaleidoscopic fluidity prevails in the novel because of the use of: 1) chiasmic structure (inverted parallelism) as a poetic device in some of the mini-chapters; and 2) parallel structure in the first sentence of every

110 In “In the Diaspora of Words,” Klaus Benesch explores the issue of originality/origin and creativity/authorship in William Gaddis’ *The Recognitions* (29–31). Benesch argues that *The Recognitions* rethinks the “very act of ‘repetition,’” reworking “the tensions between the modern notion of authenticity” and a postmodern culture of simulations and simulacra (29–32).

mini-chapter. The novel opens with a pre-chapter block of poem-like stanza in chiasitic structure and a mix of verse and prose:

This room is never anything o'clock.

Minutes slip through it like a thief in gloves. Hours fail even to raise the dust. Outside, deadlines expire. Buzzers erupt. Deals build to their frenzied conclusions. But in this chamber, now and forever combine.

This room lingers on the perpetual pitch of here. Its low local twilight outlasts the day's politics. It hangs fixed, between discovery and invention. It floats in pure potential, a strongbox in the inviolate vault.

Time does not keep to these parts, nor do these parts keep time. Time is too straight a line, too limiting. The comic tumbling act of causality never reaches this far. This room spreads under the stilled clock. Only when you step back into the corridor does now revive. Only escaped, beneath the failing sky.

Out in the template world, flowers still spill from the bud. Fruit runs from ripe to rot. Faces still recognize each other in surprise over a fire sale. Marriages go on reconciling and cracking up. Addicts swear never again. Children succumb in their beds after a long fever. But on this island, in this room: the faint rumble, the standing hum of a place that passes all understanding. (*Plowing the Dark* 3)

“This room,” which appears in the passage above, is multidimensional and chameleonic. It lends itself to a fluid and unquantifiable time of “now” and “forever” as well as “never anything o'clock.” It yields a volatile space that “floats” and ironically comes as an “inviolate vault.” Finally, it exists transcendent from the outside world. Indeed, it is not clear which room this one refers to. The description of the room can fit all spaces of the novel; the dome chamber in the physical Hagia Sophia, the dome chamber in the virtual Hagia Sophia, the Cavern, the jungle room, the hostage room, or Zimmerman's room. Moreover, the outside world, labeled as “template,” becomes chameleonic between model, copy, and original. Therefore, “this room” is liquescent; it is “a place that passes all understanding.” With no clues as to the spatial setting, the reader

floats within the volatile spatiality of the novel's setting and chapters. The material and immaterial combine and flow in one another. They stream in superimposed fashion: fictional, real, and virtual real. They reside in imagination and memories. They combine the physical and virtual but also the spiritual, virtual, and palpable. These strata of the material and immaterial do not appear in parallel only. They (now and then) mesh, converge, and disperse.

Another example of space beyond "all understanding" appears in chapter 41 in *Plowing the Dark*. The chapter is constructed in a unique structure; it is written in two lines only:

This room is dark, and without dimension.

It has no door. Or any window where you might have entered. (*Plowing the Dark* 390)

Chapter 41 appears like poetic verse and breaks with the rest of the novel's chapters that consist of prose or a mix of prose and verse-like patterns. Unlike chapter 41, the novel's long chapters give clear clues—characters' names, specific pronouns, and place names—which announce the spatial setting of the story that situates the reader in the specific context of the plot: the Cavern, Taimur, or Zimmerman. Chapter 41, in contrast, does not provide any clues, leaving the reader lost in spatial reference as a blind-folded hostage or as a totally immersed player in head-mounted-display VR. The dimensional fluidity of the room, as described in the passage above, dismantles the rigid perspectives and angles of cubism.¹¹¹ Virtual reality disperses cubic matter by imprinting it with chameleonic virtual spaces and by advancing a 360-degree freedom of perspective with a perceiver's view level. Towards the end of the novel, in chapter 43, the cave ceases to function as a clear clue for the Cavern and becomes mercurial of a possible double reference to the virtual reality environment and the hostage space at once. The chapter begins with the cave as a clue for the Cavern narrative plot. Then it

¹¹¹ The act of dismantling cubist dimensions can be read in contrast to the reference to Pablo Picasso, which appears as the name of one of the VR machines in the novel.

blurs the story clues by later using the second personal pronoun “you,” which is usually a clue for Taimur’s narrative.

In the novel, several of the mini-chapters start with a similar sentence structure and wording, with a twist of change in each of the sentences, creating a chiasmic effect between the story plots and the different spatial settings, which come out as a room of material and immaterial presence. The parallel sentence structure announces the start of all the mini-chapters in *Plowing the Dark*. The technique starts in chapter 10 (the first realized virtual room) and continues with clear clues of parallel separation between the Cavern and the hostage room until chapters 41 and 43, where they converge and blur. The parallel structures in each mini-chapter occur as the following:¹¹²

The pre-opening chapter: “This room is never anything o'clock”
(*Plowing the Dark* 3).

Chapter 10: “The Jungle Room feels strangely familiar” (67).

Chapter 13: “The room of economics runs to an open horizon” (85).

Chapter 15: “This new room still has no place to relieve yourself” (96).

Chapter 19: “In imagination’s room, all things work out” (144).

Chapter 27: “The Therapy Room is a work in progress” (228).

Chapter 30: “The warm room is shelter against the surrounding cold” (239).

Chapter 37: “The room of holy wisdom spreads its tent beneath the
dome of heaven” (342).

Chapter 41: “This room is dark, and without dimension” (390).

Chapter 43: “The room of the Cave is one continuous chasm” (400).

Chapter 44: “In the room of shared experience, she disappears” (402).

Chapter 45: “The room that holds you falls away. Space opens out in
every direction [...]” (407).

¹¹² The list states the chapter number and quotes the first sentence to highlight the correspondence.

Chapter 19 is again a block of chiasmic structure—like the pre-chapter opening. Here, the parallel sentence structure is repeated in several paragraphs of the same chapter: “In imagination’s room, all things work out;” “In this room nothing bleeds. Nothing rots. Nothing breaks;” “The people in this room grow up to become what they’ve always dreamed of being” (145). Then, chapter 19 ends with a block, compound of non-existing dimensions and connections as seen below:

But this room can’t brook any depth or width. Dimension is already too degraded to sustain. This room leaves no place to sit and absorb it. No spot where any outsider might just gaze. Even the weight of a solid glance would tip it, wreck this room’s precarious equilibrium.

This is the room to which dying people retire. This is the room from which infants are taken to be born.

This is the soul’s balanced window box, the domain of finished poems.

This is the heaven of last imagination. The paradise of detachment. The room of no consequence in the least. Of making no difference in the whole known world. (*Plowing the Dark* 145)

The passage mentioned above creates an inverted parallelism (i.e., chiasm) to the block in the beginning of chapter 19:

In imagination’s room, all things work out.

This is the place’s guiding rule. Nothing gets in that doesn’t already fit. No twist of plot, except what is slated.

In this room, nothing bleeds. Nothing rots. Nothing breaks. There is pain here, but there is no suffering. Things do grow, but never past their prime. All local flesh has learned that lizard trick of regeneration. The cheetah takes no more than half the antelope’s flank. Then the sacrifice grows back again. (145)

In lower levels of spatial distortion, chapter 22 opens with the room in Vincent Van Gogh's painting *Bedroom in Arles*, which Adie also tries to replicate in the Cavern:

This is the room life lends you to sleep in.

Bedroom. *Slaapkamer. Chambre à coucher* [...]” (*Plowing the Dark* 170)

Then the chapter carries on as follows: “In the painted bedroom, the man’s own paintings hang on view” and “[t]his will be your *kamer*, your *chamber* [...]” (170–171). *The Bedroom* brings another spatial setting, which adds a different dimension to the other rooms that exist in the novel. “*The Bedroom (at Arles)*” connotes multiple references in the novel: Van Gogh’s painting of his room, the painting as replicated in the virtual reality Cavern by Adie, Taimur’s memory of the painting, or a “cheap reproduction” (173) of it hanging in Adie’s room.¹¹³ It also brings about a different form of cubic space in visual art—depicting Van Gogh’s own room in tilted angles—which adds up to the parallel of fluid geometry.¹¹⁴ Furthermore, *The Bedroom at Arles* adds to the dilemma of original/prototype as Van Gogh painted two repetitions of the original.¹¹⁵

Chapter 20 is a regular long chapter. However, it starts with a different parallel structure that is borrowed from the opening technique of Persian storytelling. The chapter first affirms then erases the “room”:

Yeki bood. Yeki nabood.

That is how the world’s best storytellers always start: It was so. And it was not so. One of the few Persian phrases you can remember, from out of a whole childhood of your mother’s Persian phrases that you never paid

113 It is also not clear whether Van Gogh, himself, is portrayed as the father of Adie Klarpol (*Plowing* 174).

114 In his essay “Reflections on a Drawing by Van Gogh,” Fritz Novotny stresses Van Gogh’s technique of anti-representational art. These techniques, according to him oscillate between Impressionist and Expressionist forms at times (37). Van Gogh’s colors and brush strokes announce self-reflexivity (35). Novotny emphasizes as well Van Gogh’s distortion of “linear perspective” and “the deformation of the picture space” (36; 41). Novotny argues that, preceding Van Gogh, such breaking with geometrical laws is seen in “medieval, Byzantine, or Far Eastern art” (42).

115 Fiedler et al. “Materials, Intention, and Evolution: Van Gogh’s Bedrooms” (91; 93–94).

any attention to. They must be in there still, an attic of lost fables that wants only unlocking.

It's like this, and it's not like this. There was a time and there was not a time. They are right to start that way. And they are not.

Like so: you find yourself in a small room. There is a mattress here. Before you is a radiator. On that radiator, a chain [...].

And not like so: you are not here. Hope refuses even these temporary lodgings [...] (*Plowing the Dark* 146)

Accordingly, storytelling is where the story rewrites itself—reboots and refreshes—where it regenerates and renews itself like the multi-room virtual space. It is chameleonic, articulating the “liquescent” superimposed interior of the Hagia Sophia.

The mini-chapters, all starting with the same parallel sentence of the revised room phrasing, come in a short format of two lines to two pages long. These function like alternating frames (like the window frames of the Hagia Sophia) renewing the angles of visualization in surround multiplanar and transformational imprint. The mini-chapters recur twelve times in the novel, so they “trick” the reading brain into “fusing” the narrative segments into a cognitively streaming virtual kinetic depth, like the “dozen frames a second [needed] to trick [the eye] into fusing discrete images into continuous motion” (*Plowing the Dark* 28). The narrative techniques used in *Plowing the Dark* fluctuate in function, experimenting—simultaneously—with multiple operational and aesthetic capacities, transforming the novel into an “alive” environment, to borrow Pentcheva’s expression (*Hagia Sophia: Sound* 111). Pentcheva perceives architectural spaces as “alive” spaces that are aural and that converse with their visitors through a “reactive voice” that reverberates their footsteps and the choir’s chants (*Hagia Sophia: Sound* 99; qtd. in 111).¹¹⁶ Therefore, she considers that, along with the change in pur-

¹¹⁶ Pentcheva builds on the idea of Barry Blesser and Linda-Ruth Salter of the “acoustic reaction” of space, which they address in *Spaces Speak, Are you Listening? Experiencing Aural Architecture* (*Hagia Sophia: Sound* 111).

poses of the Hagia Sophia and the different trends of interior modifications, the Basilica lost its authentic acoustics (12). The Hagia Sophia has not undergone architectural changes only; the “building has lost its voice” in a form of sound iconoclasm—as she claims (12; 99; 100). Therefore, Pentcheva critiques studies that are based on a purely architectural examination of the Basilica, and she offers an alternative study involving the resonant acoustics of the architectural space in the light of “performative” “icons of sound” (11–12; 76).¹¹⁷

As Hagia Sophia’s engineer, Anthemius, experimented with thunder and earthquake effects, he is reported to have been a specialist in “visual, audio, and kinetic special effects” (*Hagia Sophia: Sound* 113, qtd. in 113). Analogously, the Cavern produces visual, sonic, and haptic immersiveness and interactivity in virtual environments, rendering material and immaterial realities “liquescent.” The Hagia Sophia could be an earlier version of “virtual reality” effects in the medieval ages. However, the reverberations of the Hagia Sophia as of today and as of those recreated in the Cavern, are not filled with spiritual voices only, they echo the different layers of empires, civilizations, religions, as well as secularism, engineering, and minds.

Whereas Pentcheva’s study is focused on the original Byzantine state of the Hagia Sophia to explore the “marmoreal” and resonant interior that reveals an authentic spiritual voice in the architectural space, a study of the original Justinianic Hagia Sophia—as seen in *Plowing the Dark*—however, always imposes, even when muted, current and historical configurations of superimposed aesthetics, civilizations, cultures, and religions—in the form of destructions, renovations, changes, restorations, or preservations. *Plowing the Dark*’s treatment of the Hagia Sophia as a virtual reality prototype brings such shifting dynamics into perspective. At the same time, prototyping the Hagia Sophia is not the only focus of the novel since it emerges within a whirlpool of multiple clashing themes and elements.

117 Pentcheva explains that although the concept “performative” is embedded in the speech-act theory and it developed in gender studies, she deploys the term *vis-à-vis* “inspiring” (i.e., divine Pneuma) (*Hagia Sophia: Sound* 14; 76).

Nonetheless, the symbolism of the physical Hagia Sophia and its virtual model underscores the novel's volatile configuration. First, the recreation of the Hagia Sophia in the Cavern environment re-enacts the flow of materiality in an alternative format; that of virtual reality. Second, the—often clashing—different cultures and disciplines fit together in the novel like the original Hagia Sophia's book-matched marble. Yet, they match with some decentralized running lines of fractures like the current state of the worn-out marble revetment.¹¹⁸ In a similar multilayered make-up of the Hagia Sophia, the superimposed structures of the novel reverberate through the intercultural and interdisciplinary panels, propagating polyphonic aesthetic and intellectual noise that keeps amplifying at any contact with another layer—present or absent. These interdisciplinary and intercultural panes refract one another, causing intellectual “late reverberation feedback”—not necessarily harmonious, but aesthetically and intellectually conversational. The composite therefore favors dialogue.

118 The fractures in the current state of the marble are clear in figs. 63 and 64 of the Hagia Sophia, respectively captioned, “Hagia Sophia, 532–537 and 562, view of the Proconnesian floor and south aisle” and “Hagia Sophia, 532–537 and 562, view of the Proconnesian pavement of the nave with light creating an opalescent effect” (*Hagia Sophia: Sound* 124).

Chapter 8 Religious-Literary Iconoclasm

The representation of the Hagia Sophia in the VR CAVE system in *Plowing the Dark* captures on-going controversies and obscure dynamics. It reveals not only *impasse* and *longue durée* perspectives, but also an interdisciplinary and inter-civilizational approach to treating the Basilica's heritage. Juxtaposing VR prototyping of the Hagia Sophia in the novel with a tracing of art developments reveals processes of image construction. It also exposes religious icons in the light of complex performativity implications. Such elements of interconnection in art and image development, religious superimpositions, and Patriarch/civilizational clashes are at the core of discourses from antique to Byzantine eras, as Jaś Elsner demonstrates. As seen in the previous chapters, *Plowing the Dark* examines similar discourses by expanding the focus to CAVE technology as well as to modern historical events and conflicts.

In this light, shifts in icons and icon dynamics appear in several aspects of the novel. In the Cavern narrative plot, Hagia Sophia's virtual replication displays the switch of icon from image to script, seen in covering Christian figurative mosaics, and inscribing Arabic verses of Muslim scripture in the interior. Image/text cultivation is further developed in the Taimur narrative plot as it rethinks image cultivation as text. This is clear in the clashing discourse, behavior, and angles of perspective between Taimur and his captors. On the one hand, the narrative segment exposes the terrorists' abuse of the Qur'an since they misuse it as affirmation of their crime. Additionally, they respond to Taimur's plea for a book by allowing him access to the religious text only. This may possibly reveal total exclusion of any other form of written text on the basis of blasphemy—as usually promoted by such extreme groups. This, in turn, stresses the limits of the terrorists' access to knowledge; it highlights intellectual impoverishment and absence of critical thinking. On the other hand, Taimur's reading of the religious scripture counterattacks the terrorists' approach. In resentment of his captors' brainwashed and obscurantist radicalization of religion, Taimur cognitively interacts with the Qur'an, digging into its conversational stance and interpreting its verses to subvert the terrorists' mindset.

By so doing, some elements of Qur'anic aesthetics and functional techniques are revealed in the novel. Powers borrows some of the motifs and interweaves them into the narrative construction. Elements of inimitability thus surface here. Nonetheless, it is important to note that *Plowing the Dark* does not bring theological elements from different religions to reveal a sort of Truth, nor does it weigh one religion, or civilization, over another. The elements are brought together to create a dialogue between controversial and diverse discourses, aesthetics, and icons. These offer refracting, flickering trends and angles of perception and cognition. Reflection on Qur'anic aesthetics and rhetoric depicts the following: cave symbolism in the Qur'an, *Sûrahs*' (chapters') formats, superimposed layers, reciting verses from the English translation, and using motifs in the digital Cavern, which are in turn titles of certain *Sûrahs*. The iconoclasm present here is thus that of the dual dynamics between abuse and counter-attack as well as borrowing and inimitability.

8.1 Inimitability: The Imitation Challenge

The aesthetics of rhetoric devices used in the Qur'an are usually attributed a "miracle" (*I'jaz* اعجاز) stance.¹¹⁹ In Islamic thought, the last miracle with which the divine has indulged a prophet is embedded in language. The prophet Muhammad is reported to be illiterate without any scholarly background, as proof that the Qur'anic verses are divine, and were not produced by the prophet himself. It is thus believed that the poetics of the Qur'an are inimitable by any human. The Qur'an is believed to have been produced in the midst of the peak of Arabic literary stylistics and Arabic language eloquence—in a society ripe in intellectual thought, or a sort of cognitive evolution, ready for divine words, and marking a shift from miracles in acts to miracles in verses. The inimitability of Qur'anic aesthetics is stressed in a verse that challenges poets to come up with one verse like the Qur'an's, inferring the poetics and complexity of the religious discourse to be beyond human capacity and, as such, of divine origin.

119 Cf. Margaret Larkin, "The Inimitability of the Qur'an: Two Perspectives" and Larkin's translation of al-Jurjani's *Dala'il al-I'jaz*, "Al-Jurjani's Theory of Discourse."

Why would literature imitate religious discourse and would religious discourse imitate poetics? Again, this can be seen in relation to iconoclasm. The divine challenges the human into an imitation game of divine eloquence and lore; in turn, the human challenges the machine into a Turing imitation game to imitate human intelligence.

Second, textual iconoclastic discourse arises in the form of the dilemma of translation. In the novel, Taimur stresses that he is given an English version of the Qur'an. In addition, Taimur's last name, Martin, establishes the connection to the act of translation in Christianity. It evokes the monk Martin Luther and his attempt to reform the Church by translating the Bible into German in the 16th century (Puchner 168).¹²⁰ Indeed, Luther's initiative was only possible because of Gutenberg's "reinvention" of print that enabled the mass production of books.¹²¹ Furthermore, the naming (of Martin) reminds us of the "third" iconoclastic discussion during the Reformation, which led to the denial of image and "the triumph of text" in the form of "the German (Protestant)" practice of "writing about art" (Elsner 386).¹²² It is also worth noting that translations of the Qur'an do exist, but they are rather considered as translations of meaning and not as an English version of the Qur'an—as in the discourse—concerns arise around the pitfalls of the text's distortion by translation. The aforementioned examples highlight different forms of iconoclastic discourses that are text based. Along with the dilemma of inimitability and translation, interpretation is equally staged in Taimur's active reading of the Qur'an.

Plowing the Dark's borrowing from the Qur'an is not an attempt to reveal the imitation challenge. Rather, it sheds light on the diversity of aesthetics and discourses in different media, religions, and disciplines.

120 Martin Luther studied law and philosophy before becoming a monk (Puchner 161). As Puchner explains, Luther's translation of the Bible into German was meant to give the regular people access to the words of God, and the opportunity to see for themselves the transgressions of the Church on imposing "indulgences" that supposedly redeem their sins in contribution to financing the military (154; 168). Luther's Bible inspired William Tyndale to translate the Bible into English against the English law that prohibits "unauthorized Bible translations" (169). The English version was, therefore, also printed in Germany (169).

121 Martin Puchner, *The Written Word* (151; 156).

122 According to Jaś Elsner, the German Protestant practice of writing about art led to the emergence of art history (386).

The novel brings these strata together in a conversational platform for the reader to see how they influence, and challenge, one another.

8.2 Caves in Islamic Scripture

Apart from the CAVE technology, and upper-Paleolithic Lascaux caves, the cave takes a third dimension of symbolism in *Plowing the Dark*. Here, the cave connects to two elements in the Qur'anic stories, through possible reference to *Ghar Hira'* (غار حراء) and *Sûrah* 18. *Al-Kahf* “The Cave” (سورة الكهف). Both *Ghar* (غار) and *Kahf* (كهف) are Arabic terms for “grotto” or “cave.” *Ghar Hira'* symbolizes divine revelation to Prophet Muhammad. It is the grotto where Muhammad is believed to have received the first words of God through the archangel Gabriel (*Jibril*), marking the instance in Islamic belief in how the Qur'an was progressively passed on to the prophet. *Plowing the Dark* refers to the revelation moment, pinpointing the cave reference in that specific instance: “[...] You listen in to the archangel Gabriel, dictating to the Prophet in his subterranean cave” (*Plowing the Dark* 323). In his book *Rewiring the Real*, Mark C. Taylor stresses how cave symbolism appears in different religions. To support the argument that “[p]hilosophy, religion, and art began in a cave,” Taylor refers to the cave in Plato's *Republic*, Christian gatherings in Roman catacombs, and Hira' Cave for the start of Islam (Taylor, *Rewiring the Real* 78). The first Qur'anic chapter—revealed in Cave Hira' in Mountain *Jabal Al-Nûr* in Mecca—is deemed to be *Sûrah* 96. *Al-'Alaq* (سورة العلق), translated into “The Clot.”

Chapter *Al-'Alaq* ironically starts with the word “read.” Therefore, from the start, the religious chapter juxtaposes reading with religion, creationism, and what is interpreted as a biological description of the human embryo (more specifically, a fertilized ovum implanted in the uterus wall). One English translation of meanings and commentary, under the title *Translation of the Meanings of the Qur'ân in the English Language* by Muhammad Taqî-ud-Dîn al-Hilâlî and Muhammad Muhsin Khân, presents chapter “The Clot” as follows:¹²³

123 The title of the book announces that it does not aspire to offer a “faithful” translation of the Qur'an. The translation includes commentaries, and attempts to translate the understanding, which is common practice in Islamic studies out of concern over possible distortions of the Qur'anic text. This is why the Arabic text is also included in the transla-

1. Read¹²⁴! In the name of your Lord Who has created [...].
2. He has created man¹²⁵ from a clot¹²⁶ [...] [“a clinging substance”].
3. Read! And your Lord is the most Generous.
4. Who has taught (the writing) by the pen.
5. He has taught man¹²⁷ that which he knew not [...]
(*Translation of the Meanings* 846 [*my omissions; my additions*]).

An excerpt of *Sûrah* 18. *Al-Kahf* (سورة الكهف) “The Cave” also shows how the cave is a recurring element in Qur’anic scripture, here, associated with a sense of shelter in divine protection. The passage below narrates an allegory of divine miracle, perceptive illusion, and fluidity of time.

8. (Remember) when the young men fled for refuge [...] to the Cave. They said: “Our Lord! Bestow on us mercy from Yourself, and facilitate for us our affair in the right way!”
11. Therefore We covered up their (sense of) hearing (causing them to go in deep sleep) in the Cave for a number of years.
12. Then We raised them up (from their sleep), that We might test which of the two parties was best at calculating the time period that they had tarried.

tion. Nonetheless, the translation, quoted above, often times elaborates on certain terms or passages in brackets, giving a strict understanding of parts of a verse, without any academic method of argument, support of sources, or examination of different discourses and interpretations. The method could reinforce a one-sided misconception or patriarchal understanding, without leaving any room for discussion.

124 The word is interchangeably translated in different scholarly works as “recite,” which may be connected at that time to the ability to recite/create poetry, to which Muhammad responds repeatedly—as the biographical text of Muhammad (*Sîra*) details—that he “cannot recite” (“A Mystery of Revelation” 136–137). I will use the term mostly as “read,” invoking both meanings.

125 In the Arabic verse, it is mentioned as (الانسان) “the human being.”

126 The translation of the word [Al-‘Alaq] (العلق) is elaborated in brackets in the above translation as “a piece of thick coagulated blood” (846). In other versions it appears as “a clinging substance,” which I find closer to the Arabic term (qtd. in “A Mystery of Revelation” 136).

127 “The human being.”

13. We narrate to you [...] their story with truth: Truly, they were young men who believed in their Lord [...], and We increased them in guidance.

[...]

18. And you may have thought them awake, whereas they were asleep. And We turned them on their right and on their left sides, and their dog stretching forth his two forelegs at the entrance [of the Cave or in the space near to the entrance of the Cave (as a guard at the gate)]. Had you looked at them, you would certainly have turned back from them in flight, and would certainly have been filled with awe of them.

19. Likewise, we awakened them (from their long deep sleep) that they might question one another. A speaker from among them said “How long have you stayed (here)?” They said: “We have stayed (perhaps) a day or part of a day.” They said: “Your Lord (Alone) knows best how long you have stayed (here).” [...] (*Translation of the Meanings* 386 [my omissions])

These two symbolic references to the cave, which are borrowed from the Qur’an, add a different dimension to the novel in its interaction with cross-religious and cross-cultural superimposed layers. In addition, Taimur reads the book in three levels: quantifying time, aesthetic examination, as well as conversational reception and negotiation.

8.3 Quantifying the Flux of Time

As he starts to slip into the fluidity of years like the cave companions (sleepers), Taimur turns reading the verses into an instrument of time demarcation. He first starts to measure time through the call to prayer on Fridays: “You carry on numbering the days, desperate for form, although the tally no longer correlates with anything. The week arrives when you can’t make it from one Friday call to prayer to the next without disorientation [...]—this drift into terror, into utter timelessness” (*Plowing* 321).

Then Taimur’s time measurement carries on into an alternative method in the hope for structure, as he shifts to a self-demarcation of the Qur’an verses into precise temporal units. For Taimur, the act of

reading transforms into a way of time quantification to keep a “perfected calendar” and a sense of temporal direction within the solitary total confinement that creates “timelessness” and therefore “disorientation.”

This room's day permits only the crudest clock. Sometimes it is dark; sometimes a little darker. The only reliable instrument here is your English Qur'an, that earthbound perjury of heaven's uncreated original. Its pages solidify into a discipline, the rigorous training for a track meet you must get ready for. Reading is your daily regimen, each session coming to a forced stop after ten verses, wherever that leaves you. Whole surahs dangle right before the end, or break off bluntly after just starting. Only the count counts. (*Plowing the Dark* 321–322)

The narrator carries on:

[...] These measured-out passages keep you tethered in the flux of time. If you start at the *fatiha* and sum the verses you have read, then divide the total by ten, the quotient yields, by the miraculous dictate of numbers, the total number of days that have passed since you received the word. This is your new perfected calendar, dating not to any fixed year but resetting all dates to your own private *hegira*. (322–333)

The use of the term “*hegira*” implies a different calendar system, which starts with Muhammad's “migration” (*hegira*) and follows lunar-month demarcation, unlike the solar-based Gregorian calendar. The presence of diverse time demarcations in the novel, including Taimur's self-created system, highlights the fluidity of time, which is also seen in the sentence: “This room's day permits only the crudest clock. Sometimes it is dark; sometimes it is darker.”

8.4 Probing Qur'anic Aesthetics

Taimur probes some aesthetic elements from the Qur'anic text in a post-structuralist reading, which in turn influences parts of the structure in *Plowing the Dark*. A post-structuralist analysis of the form of the Qur'an's narrative is captured here:

The verses themselves evade you. Their linked riddles will not crack. But the torrent of words, their sense-free cadences suffice to hold you, even in the absence of story. Their pageant of sounds drowns out of your own incessant dunning. The throwaway phrase “and the water-bearer let down his bucket” expands in your eyes for hours, sounding in your ear for all the world like a soul-saving miracle, the most magnificent idea, the roundest image you have ever stumbled on. (*Plowing the Dark* 322)

Plowing the Dark experiments with disconnection between Zimmerman passages, some Cavern passages, and the room in which Taimur is held hostage. Its narrative also breaks with a strict prose format: the novel is dissected into mini-chapters of two lines to two pages (like poetry or verse) and long chapters (in prose), which alternate throughout the novel. The chapters do not always link, and at times intentionally blur the setting and characters. The length of the sections can be compared to the way the Qur’an appears in short chapters and long ones that do not necessarily connect or reflect their title. Taimur examines the Qur’an’s composition:

You search the whole book, for a larger architecture, some forward motion that could pass for form. But the verses possess only the most astonishing organizing principle. The chapters proceed from longest to shortest, starting in prose and ending in prayer. (*Plowing the Dark* 323–324)

The disunity of the novel also builds on the use of intertextuality, which apart from other textual borrowing, encompasses Qur’anic extracts from an English translation. Chapter 37 of *Plowing the Dark* quotes an English version of the calligraphic inscription in the dome of Hagia Sophia, which was added under the Ottoman era, during which the Basilica was transformed into a mosque. The original calligraphy captures verse 35 from *Sûrah* 24. *Al-Nûr* (سورة النور) “The Light” in Arabic script; however, in the novel it appears in English and is incomplete, as follows:

Ringling the dome run these words, cut there by the supreme calligraphers, this room's most recent owners:

God is light

Of Heaven and Earth.

His light is a niche in which there is a lamp,

the lamp enclosed in a globe of glass,

the globe of glass a shining star

lit from a blessed olive tree

neither of the East nor the West... (*Plowing the Dark* 343–344)

Equally, the Qur'anic chapter title "The Bee" is mentioned in the novel as seen in the block quotation below. Thus, the digital bees in the Cavern (*Plowing the Dark* 16) draw parallels with the biological bees in the Qur'an in *Sûrah* 16. *An-Nahl* (سورة النحل) "The Bees." *An-Nahl* is mostly about the creation of different elements and creatures: fruits, cattle, sea animals and jewelry material, birds, shadows, mountains, and bees. It is written mostly in the second personal pronoun in plural "you." The following is the translated meaning of verse 68. "And your Lord inspired the bees, saying: 'Take you [sic] habitations in the mountains and in the trees and in what they erect'" (*Translation of the Meanings* 356). Another level of superimposition in *Plowing the Dark* is here generated through juxtaposing contexts of creationism, and artificial recreation or modification. Human-made pseudo-life in *Plowing the Dark* is seen in the digital bees: "Little bees! And they're buzzing! [...] Something turned over in her [Adie], as small, as social, as buzzing and robotic as the living original" (16). Similar artificiality also concerns Implementation Helen in *Galatea 2.2*, and aspiration for genetic engineering in embryos in *Generosity: An Enhancement*.

Plowing the Dark is loaded with allusions to the Qur'an, as seen in the following passage:

This ritual hammers out a few still moments to stand in. It steadies the swirl of eternity, for as long as the verses last. This time you ration yourself, sustain the escape. The Cow, the Bee, the Table: just the mystery woven into these chapter names diverts you from hovering madness. However reconfigured this Jonah, this Joseph, this Abraham, they make their way against the backdrop, under the Thunder, out from the Cave, along the Night Journey. Say, the words of the Prophet always start. Say: *were the sea ink for the worlds of God, the sea would fail before the words did.* (*Plowing the Dark* 322)

The above passage lists some Qur'anic chapters: "the Cow" (*Sûrah* 2. *Al-Baqarah* البقرة); "the Bee" (*Sûrah* 16. *An-Nahl* النحل); "the Table" (*Sûrah* 5. *Al-Mâ'idah* المائدة); "Jonah" (*Sûrah* 10. *Yûnus* يونس); "Joseph" (*Sûrah* 12. *Yûsuf* يوسف); "Abraham" (*Sûrah* 14. *Ibrâhîm* إبراهيم), "the Thunder" (*Sûrah* 13. *Ar-Ra'd* الرعد); "the Cave" (*Sûrah* 18. *Al-Kahf* الكهف); and "the Night Journey" (*Sûrah* 17. *Al-Isrâ'* الإسراء). Then, the passage ends with a part of verse 109 from *Sûrah* 18. "The Cave." Hence, the more Taimur reads, the more intertextuality is revealed. Some of the chapters are named after prophets that preceded Muhammad, resonating a further complex intertextual reading. Such stories hence parallel biblical (Genesis) elements, and similarities with ancient Greek stories such as the Seven Sleepers.¹²⁸ In addition, interdisciplinarity strikes in the Qur'an in the co-presence of poetic style along with scientific, legal, astronomical, and fantastical components. The cross-referencing hence enhances the conversational aspects in the novel.

128 For a more comparative study on the references to Joseph in the book of Genesis and the legend of the Seven Sleepers of Ephesus, see Ian Richard Netton's "Toward a Modern Tafsir of Srat al-Kahf: Structure and Semiotics."

8.5 Conversational Dimensions

[...] You listen in to the archangel Gabriel, dictating to the Prophet in his subterranean cave. This story extends itself only in hinted wisps, as if all readers already know the plot. But the more gloriously cryptic, the better. Each ten-verse maze holds you longer than the *Sunday Times* crossword ever did.

You search the whole book, for a larger architecture, some forward motion that could pass for form. But the verses possess only the most astonishing organizing principle. The chapters proceed from longest to shortest, starting in prose and ending in prayer. Still, it swells, this staggering dialogue: God, His Prophet, and the cast of broken humanity, in a three-way game of telephone where only endless repetition forces the words to correspond with what they figure. (*Plowing the Dark* 323–324)

Taimur ponders on Qur'anic conversational elements and the narrative follows in patterns. The chapters about Taimur Martin in hostage seclusion in Beirut, Lebanon, in *Plowing the Dark* read in second personal pronoun in singular “you” and feel like they address the reader at the moment of reception. The technique of second personal pronoun is often used in singular in the Qur'anic passages that are interpreted to address the prophet, and in plural in the passages that seem to communicate with the people (humanity).

In her book, *Hagia Sophia: Sound, Space, and Spirit in Byzantium*, Bissera V. Pentcheva discusses instances of performative iconic sound as present in Christian Byzantine culture; she stresses that “[t]he prophet [in this context, David] functions as an ideal sonic mirror, echoing the divine utterance” (*Hagia Sophia: Sound* 147). Pentcheva bases her argument on Justin Martin’s idea of prophets “as men who reiterated only what they heard and saw when inspired by Holy Pneuma” (147). *Plowing the Dark* plays with a similar concept of “sonic mirroring,” with a focus here on Islamic context. In the novel, Taimur reflects on the notion of reiteration recurring in the Qur’an, when the prophet Muhammad is addressed and called upon to repeat God’s words. In consequence, as a chain caused again by the pronoun “you” and other rhetorical devices,

the reader restates what the prophet reiterates following divine words. Whereas, as it appears in Islamic faith, communication of divine utterance to the prophet occurs via “revelation” (*wahy* وحي) through the angel Gabriel, Taimur’s echoing re-utterance happens by means of reading the verses that are directed to the prophet.¹²⁹ The sonic reproduction through revelation from God to Gabriel, then from Gabriel to the prophet, transforms by means of transmission from the prophet to the person through (Qur’an) reading—which constitutes the first word to be revealed to Muhammad: (*Iqra* اقرأ) “read!”

The “dialogue” chain pertains again as the reader speaks exactly what Taimur reads. However, the verbal echo in *Plowing the Dark* occurs through recitation of the English translation of Qur’anic passages. This is clear in the extract below, which quotes—in italics—an English version of: verses 1-4 from *Sûrah* 113. *Al-Falaq* “The Daybreak” (سورة الفلق); verses from *Sûrah* 114. *An-Nâs* “Mankind” (سورة الناس) with omissions; and verses 23 from *Sûrah* 103. *Al-‘Asr* “The Time” (سورة العصر). In the following, the reiteration is reinforced through the request “say,” and the use of the second pronoun “you” as reference to Taimur in the narrative plot of Beirut:

You lie in the Prophet’s slime-laden cave, taking the complete dictation all over again. *Say: I seek refuge in the Lord of the daybreak, from the evil of what He has created; and from the evil of the night when it cometh on; and from the evil of the blowers upon knots. Say: I seek refuge in the Lord of men, from the evil of the whisperer, from jinns and men.*

You do. You say what it says to say. Out loud. You recite your *fatwahs* and divinations for a live audience of the word-starved. Chapter and verse. Forward and back. No one comes to tell you to break off. *Verily man is in loss, save those who believe and do right, and bid each other be true, and bid each other be patient. (Plowing the Dark 324)*

129 For an extended explanation of the differentiation between “revelation” and “inspiration” (via the invocation of the divinity, the Muse), see Cornell Monette’s “A Mystery of Revelation” (138).

Taimur, however, does not stop the oral echo at the level of reading. Taimur transitions into an active “listener”: he discovers conversational dynamics in the book and uses them first to survive the crashing total isolation, and second to negotiate his release by subverting his captors’ fallacies.

For a long time, talking to the book is conversation enough. Then the book runs out. You restart [...]. And all those repeated commands to *Say, Say* at last force you to take the ideas live, into the realm of surprise, or real listeners.

You target the simplest, most religious of your keepers, the next time he lingers over a delivery. “Sayid, doesn’t the Prophet say that you must never steal?” (324)

Sayid agrees with Taimur’s rhetorical question. Taimur shows evidence in the Qur’anic verse and proceeds to undermine from within the deeds of the terrorist group, as he uses the same text they pretend justifies their acts of terror. In this respect, Taimur accuses Sayid, “But you have stolen me. You have stolen me from my life, and from my mother, and my... family. This is the worst theft of all” (*Plowing* 324). The question nonetheless shakes Sayid into confusion, revealing his submission of his freedom of intellect to his superior. He responds: “Mr. Taimur, I cannot know. I ask Chef. Tomorrow. *Inshallah*” (324). After two days, Sayid returns and avoids speaking until Taimur asks again about the Chief’s decision, to which Sayid replies that, “Chef say [sic] not to talk to you. You think like a snake” (325). At this point, Plato’s allegory of the cave is reversed. Unlike the cave prisoners in Book 7, the prisoner (Taimur)—away from light, inside a dark room chained and blindfolded most of the time—demonstrates a better clarity of perception and critical thinking, as he rejects “the truth” that his “free” captor holds. In turn, Sayid (the “free” captor) does not think for himself. Instead, he allows his chief to dictate his acts and thoughts.

Although Taimur surpasses his captors in critical thinking, his cave still embodies human injustice and an act of transgression. He also fails to convince his keeper, highlighting the limits and complexity of

speech in performative implications. In this case, Sayid listens to his chief's orders, rather than to Taimur's arguments or interpretation of the religious text. Following this logic, theorist Olfa Youssef believes that debunking fundamentalists' discourses by only using the Qur'an is ineffective. Instead, she advocates for an updated interpretation that integrates a modern historical and social context and adoption of human rights.¹³⁰

The cave in *Plowing the Dark* becomes multiplanar. Depending on the context and the borrowing, it appears as a space of confinement, darkness, disorientation, ignorance, and injustice, or as a space of peace, revelation, meditation, and enlightenment. In other instances, it also occurs as a space of imagination. In accordance, the Qur'an cave also acts as a reverse of Plato's cave, yet it portrays a safe place of escape and protection, instead of one of imprisonment and punishment. Muhammad receives divine revelation in the cave. The same goes for the people of the cave in *Sûrah Al-Kahf* as they take refuge in the den and resign to a long sleep under divine protection—as the scripture shows.

Reversing Plato's allegory is seen again in chapter 43 of *Plowing the Dark*; however, under a different interpretation and context:

The room of the Cave is one continuous chasm [...]
 Here you have lived since childhood, facing the darkness, taking shadows for the things that cast them. On the walls of this room, a story unrolls. In it, someone just like you gets miraculously sprung. He turns to the light, which instantly blinds him. You cheer for him to run, but he turns back from the glare to the safety of this room. (*Plowing the Dark* 400)

In the passage above, the confined individual (of a hostage room, a VR Cavern, or the mind) dwells in the "shadows" and grows accustomed to the "safety" of space and confinement. Leaving the cave and reaching

130 In the translator's preface of *The Perplexity of a Muslim Woman: Over Inheritance, Marriage, and Homosexuality*, Olfa Youssef is classified among the most prominent theorists in using "methods of the new scholars" in subverting the traditional interpretations of the Qur'an and their established rules (3). She applies "modern linguistics, semiology, and psychoanalysis" in her readings, and dwells on the ambiguities to offer "new avenues" alternative to the patriarchal traditional norms (3).

“light” in this context does not free the prisoner from the shadows into “the Truth” (as Plato’s allegory goes). The following passage highlights the persistence of confusion instead:

Your eyes adjust to the light of this hypothetical. What you take to be the boundless world may be no more than just this underground spring. You make out the peep show to be just a peep show, but only through the clip projected in front of you. The clunkiest of puppets say *shadow*, say *story*. And in that tale—continuous, no spaces—the tale you’ve been chained to since birth, you make out the room you live in. [...]

The room of the cave is something more than allegory. But the room of the cave is something less than real. Its wall shadows ripple with an undercurrent of substance, more than representation, but not yet stuff. Notion springs to life from the same, deep source in which the outdoors is scripted—what the run-on Greek once called the Forms. (400)

On the reverse sides of the grotto’s multi-symbolism, the cave in the novel is not an allegory and is not about “Truth.” This is seen in the affirmative enunciation: “The room of the cave is something more than allegory. But the room of the cave is something less than real.” Moreover, the light is “hypothetical” and the “shadow” is “story.” In this hyperreal instance, the novel repeats the structure of reiteration, by having the narrator say: “say *shadow*, say *story*.”

The need for conversation and dialogue that persisted in captivity carries on after Taimur is set free, and it shifts from the act of reading to writing. When still a hostage, Taimur was indeed not allowed any pencil or paper:

Muhammad [a character] must understand the curse of literacy: “I need paper and pencil,” you harass him, [...] “Anything to scratch on [...] Who is going to read it? What possible danger can it be? I’ll hand it all over the day you let me leave.”

He will not listen to reason. He treats you as if you are already mad.

“Look: you are Lebanese. The Lebanese *invented* the damn alphabet.” The worst, culprit technology. The rod that dislodged the murderous boulder. “You practically created writing. Does that mean nothing to you?”

It does. Mean nothing. (380–381)

The irony of writing, here, comes in two contexts: 1) it springs from the invention of the alphabet and weight of writing in the Levant civilization; and 2) the importance of the pencil/pen in Islamic discourse, seen as a recurrent motif in *Sûrah Al-Alaq* and *Sûrah 68. Al-Qalam* “The Pen” (سورة القلم). Respectively, the irony points out the obscurantist strategies that the terrorists believe in through the prohibition of writing and reading. In the novel, the “pencil” also becomes a recurrent motif in the Crayon Room/Crayon World (*Plowing the Dark* 18–19). It reappears again in the novel’s ending at the encounter of Taimur with his daughter, Scheherazade: “‘Look,’ she [Scheherazade] says, shoving her drawing into your shaking hands. A crayon man, returning to a crayon home. ‘Look! I made this for you’” (*Plowing the Dark* 415).

The novel ends with a kid’s drawing of what looks like the act of the child’s father going back home. Thus, Taimur’s daughter, Scheherazade (whose name refers to the symbolic protagonist and “storyteller” of *1001 Nights*), shifts the act of oral narration to drawing. This reinforces the infinite loops of storytelling. *Plowing the Dark* sketches the development of storytelling through perceiving shadows then acts of reciting, drawing, writing, reading, and coding. The chronology of these loops keeps shifting and overlapping in distinct contexts as the novel reveals. In the absence of a pen in captivity, the power of reading for conversation shifts into remembering and telling:

The stories keep coming, flooding their banks, reverting. Your brain is a used bookstore that buys more than it sells. Its shelves will not hold [...]

You need to tell someone. You need someone to tell. You tell the rodent, until she, too, disappears. Even a mouse’s life span makes more sense. (*Plowing the Dark* 381)

When released, Taimur's dwelling in the power of conversation migrates from reading and verbalizing to writing:

[...] it calms you to write this book. Your head scribbles hundreds of pages at a go, and reads them all back to you, verbatim. For your memory has become prodigious, your story infinite...

You try passages out on the mouse. Practice oral recitations, tri-weekly checkups to test your trembling mind. On the day you left Chicago, you could not keep a new phone number in your head for fifteen minutes. Now you are a concert pianist of the verbal arts, performing huge narrative rhapsodies by heart. Who cares if the brilliant solos may be, in fact, the wildest crashing dissonance?

Deep in those prodigious mnemonic galleries, stores of letters to everyone you have ever cared for pile up in teetering stacks, awaiting postage. The gardens of memory grow so ornately, radioactively rococo that their topiary spills over in all directions and all paths return to lushest underbrush. (380)

Accordingly, Taimur's act of writing, springing from "memory," transforms in turn into reiteration ("reads them all back to you, verbatim"), opening up again the loop of conversation and its manifold methods. In the process, the story becomes "infinite" and the writer transmutes into a "concert pianist of the verbal arts, performing huge narrative rhapsodies by heart," while combining "solos" to create "the wildest" "dissonance." The tales thus told recycle and enact conversation in an interminable loop.

Chapter 9 The Novel as Crafted by Richard Powers

Chapter 9 recapitulates the findings explored in the previous chapters of this work in order to provide an overview of the novel, as crafted by Richard Powers, in a nutshell. Therefore, the multiplicity of the already discussed ideas and structures requires a catalog style of language here. In the previous chapters (6, 7, and 8), an in-depth analysis of *Plowing the Dark's* narrative structure greatly enabled the exploration of the gist of the structural iconoclash and the reverberation patterns that create the conversational flow in the novel. At the same time, it exposed the different superimposed layers that fabricate and interweave the narrative. These structural aspects are also reflected in the three novels, discussed in the previous parts of this work, i.e., *Galatea 2.2*, *The Echo Maker*, and *Generosity: An Enhancement*. All four novels yield a dialogue that continually builds up. The connective make-up of the novels resides in the multiple hints and the superimposed strata (of technological components, the different modes of artificial evolution, the evolution of artifacts, and civilizational markers). These complex strata reveal the dynamics of the different schools of thought within and across the (inter-)disciplines. Disciplinary and interdisciplinary breakthroughs overlap, expand, and cross-fertilize. Therefore, the interdisciplinarity of each novel intensifies in turn these dynamics.

The novels parallel one another by experimenting with different disciplines and interdisciplines. Many of them are nascent and hybrid. Indeed, they reveal clashing and complementary theoretical backgrounds and approaches, civilizational influences, and evolutionary developments. The conversation thus continues through the interdisciplinary function of the novels. In so doing, each novel not only interconnects literary works but brings to the interface disciplines that may not seem to interact. While analyzing the way the novel is crafted by Richard Powers, a major aspect becomes visible, that is, Powers' narratives create a type of interdisciplinarity that provokes, in turn, an interconnectivity of the ideas and an evolution of the art.

In this respect, *Plowing the Dark* does not start a war of images. Instead, it reflects on the image wars and experiments with them in the literary creative space to observe how they function when placed side by side in the narrative. In the meantime, the novel does not prevent the proliferation of the war on images either. In fact, it stresses different forms of iconoclashes, highlighting “the interferences” (as seen in the previous chapters of part III, and explained through Latour’s theory). As *Plowing the Dark* reflects on the virtual recreation of the Hagia Sophia, with all its levels of civilizational transformations, it functions like the museum effect—museums as Latour calls them: “the temples in which sacrifices are made to apologize for so much destruction, as if we wanted suddenly to stop destroying and were beginning the indefinite cult of conserving, protecting, repairing” (“What is iconoclash?” 15). Hence comes the borrowing from—and experimenting with techniques of—the Hagia Sophia, the VR CAVE, and the Qur’anic scripture. In the process, further cross-cultural interdisciplinary elements are revealed. These include prehistoric art and modern art, Hellenistic philosophy, Byzantine Orthodox culture, *One Thousand and One Nights*, as well as Persian techniques of storytelling. Powers’ novels are concerned with theories, schools of thought, art movements, and experiments. They treat artificial evolution and the evolution of artifacts.

As previously addressed in the different parts of this work, Powers’ novels address architectural modeling and copies of artifacts in the CAVE system, the hyperreality of artifacts, the virtuality of war, rare diseases of delusion, doubles, and imposters, artificial neural networks, the simulated brain, engineered genomes, and cognitive maps as well as body maps in the brain. The novels’ diverse topics and structures dwell on *the desert of the real*, i.e., *the simulacrum*. They are simulacra based on artifacts. Respectively, all the elements from the above examples create a novel that is *neither allegory nor real, neither total representation nor thing, neither substance nor matter, and neither story nor finite*—like “the room of the Cave” (*Plowing the Dark* 400–401).

In the same logic, Powers’ novel is neither totally Western nor Eastern. It is neither Greek nor Arabic. It is neither religious nor atheist, neither pagan nor monotheist, and neither Christian nor Muslim. Powers’ novel is neither aesthetic nor political, neither mimetic nor perfor-

mative, and, finally, it is neither literary nor technological. It envelops all the complexes together in an iconoclasm of structures that make it intercultural and interdisciplinary. Further intertextual and interdisciplinary superimpositions amplify interconnected channels in the novels. Conversational aspects are picked from different contexts, aesthetics, and (inter-)disciplines. Different points in history are tested on a contemporary literary platform to expose how the various components have evolved and to anticipate how they will further evolve. The different elements are examined in terms of what they add when positioned under another light and when combined with several other components, which are borrowed from diverse historical, cultural, and interdisciplinary patterns.

In this respect, Richard Powers endeavors to engineer “thinking narratives” that are *artificially intelligent*, creating multiplanar narrative frames that keep regenerating and offering “parallax views” or malleable channels—in addition to exponential growth and transformations.¹³¹ The following points distill the findings from the previous chapters that emphasize the malleable and regenerating connections that the narratives offer. As seen earlier, *Galatea 2.2* experiments with the connectivity of artificial neural networks through Implementation Helen. By so doing, it explores, hand in hand, channels of interdisciplinary links in machine plasticity within reversal of brain engineering and machine learning. Cognitive architecture is again highlighted in *Plowing the Dark* via the trope of the mind as the primal VR. In turn, architectural–literary

131 Following Kojin Karatani’s use of the term “parallax” and analysis of political economy, Slavoj Žižek highlights the necessity for a philosophical methodology and critique that adopts “the parallax view” (“The Parallax View” 121). As he explains, “parallax” offers the possibility to shift perspectives and to think of an object, concept, or reality through different positions (121–122). A parallax view, according to him “brackets” “unresolved antagonisms,” such as “economic relations” and “political status apparatus” to better understand democratic processes (128–129; 134). He argues that such method enables us “to approach the totality of our experience” within a “globalized universe” (134). However, Žižek dismisses the extension to multiple positions at once, disregarding as well the social dimension (129). For him, too many elements obscure vision (129). I use the term “parallax views,” here, in the sense of the shift of perspectives or positions, as seen in Powers’ novels through the inclusion of the so-called “antagonistic” artistic, civilizational, and disciplinary dimensions. According to my analysis of Powers’ novels, a multiplicity of perspectives is necessary to reach irreducibility, and bracketing different elements enriches the field of view rather than obscures it.

iconoclasm in *Plowing the Dark*, through narrative superimposed structures and book-matched parallelism, creates a fluid space of visual and aural imprints in a multidimensional, multi-frame construct of artificial regeneration. These favor, in turn, a dive into the virtual environment of the CAVE technology. CAVE patterns in the novel fashion a technological-literary iconoclasm within the multiplanar immersive narrative fabrication. In the case of *The Echo Maker*, the novel marks cognitive mapping and body maps in the brain that stress the malleability and plasticity of cerebral architecture as well as mind simulacrum. Finally, a different aspect of malleability and connectivity is stressed in the meshed genomic code architecture in *Generosity's* narrative. In *Generosity*, the literary "DNA" is constantly cut and edited into a mix with the scientific "DNA" through genomics jargon and theories. The fictional is also modified into creative non-fiction in parallel with TV reality and confessional internet culture. All the aforementioned aspects turn Powers' novels into an artificially intelligent novel, constantly tested against the platforms of iconoclashes. The result is an interactive novel that is elastic and malleable as well as editable and imprintable.

With the overload of hypertextuality, intermediality, intercultural components, and especially the excess of interdisciplinarity, the novel goes beyond the mimetic faculty and regenerates via the alterity faculty. It constructs simulacrum environments, which experiment with codes, artifacts, and interdisciplinary minds. These happen through the penetration of different interdisciplines and imprinting the novel with superimposed strata of conflicting and overlapping fields, theories, and approaches. It is the multidimensional and immersive self-reflexivity that perforates fluid borders and explores new passages, while artificially and constantly refreshing the flow and the connecting channels into accumulative, evolving output. Artifacts and (inter-)disciplines refract in the narratives like channels of pluralistic discourses, interconnected over history. These overlap, transform, as well as clash. They reconstruct themselves in a non-static non-exhaustive infinity of combinations and disparate directions. Rather than the Enlightenment paradigms of cause-and-effect relations and linearity, Powers' novels experiment with exponential growth of accelerating returns, along with non-linear events and interconnections. In this vein, they flatten interdisciplinary hierarchies.

As examined in chapters 6 and 7, the structure of the novel is chameleonic and liquescent, imprinting different disciplines and cultural elements as a multi-panel virtual space. It is multi-structural, and impregnated with interdisciplinary iconoclashes. In addition to transforming, clashing, and overlapping, these structures evolve artificially—in and out of sync—with technological and scientific discourses, historical and political patterns, as well as aesthetic and artistic movements. The novel, therefore, combines various elements from different (interdisciplinary and hybrid) fields. By so doing, it lets its structure be porous, absorbing—and allowing infiltration of—the composites' variations. Re-working the variations within new superimposed contexts, combinations and connections, in turn, leads to a new form of the interdisciplinary novel—renewable like a malleable architecture. This form of artistic iconoclash strives for interdisciplinary thinking. It reflects, through writing, cerebral plasticity and connective Minds, and it pushes the brain—in the reading process—to expand its cognitive mapping, multi-planar virtual imagination, and neuronal connections. The cognitive processes engage the brain as well to process exponential growth (i.e., non-linear thinking) to evolve beyond Enlightenment's rigid linearity and causality towards exponential, multiplanar, and connected thinking.

9.1 Cross-cultural Elements

In the case of *Plowing the Dark* and *Generosity: An Enhancement*, it is seen that, for the interdisciplinary structure to function at its best, it requires the intercultural aspects as well. Therefore, the narrative iconoclashes of the novel construct a form of intercultural and interdisciplinary multi-frame American literature, reshaping the Western tradition of intertextual palimpsest. An extensive discussion of identity variations and civilizational complexity in relation to the Middle-Eastern and North-African contexts in *Generosity* and *Plowing the Dark* is detailed in part II. These include Iraq-Kuwait, the Persian Gulf War, Lebanon, Algerian civil war, and Tunisian civilizations. Qur'anic structures and the scripture's aesthetics are discussed in depth in chapter 8 in relation to *Plowing the Dark*.

In addition, Powers' novels include references to Persian oral storytelling techniques as well as references to the collected stories in the written book of *One Thousand and One Nights*. *One Thousand and One Nights* is an Arabic collection of stories from several regions of the world; namely, Persia and India, which also includes 101 Arabic stories (see Claudia Ott). Persian storytelling elements appear in reference in the following passage from *Plowing the Dark*:

Yeki bood. Yeki nabood.

That is how the world's best storytellers always start: It was so. And it was not so. One of the few Persian phrases you can remember, from out of a whole childhood of your mother's Persian phrases that you never paid any attention to. They must be in there still, an attic of lost fables that wants only unlocking.

It's like this, and it's not like this. There was a time and there was not a time. They are right to start that way. And they are not.

Like so: you find yourself in a small room. There is a mattress here. Before you is a radiator. On that radiator, a chain [...].

And not like so: you are not here. Hope refuses even these temporary lodgings [...] (*Plowing the Dark* 146)

While *Plowing the Dark*'s use of the Persian technique is apparent in chapter 20 and towards the end, *Galatea 2.2* is narrated from the start according to the Persian phrase *Yeki bood, Yeki nabood*. The whole novel begins with the phrase "It was like so, but wasn't" (*Galatea* 3). Such assertion and erasure of the plot, the story, and the characters are recurrent in *Generosity* and *The Echo Maker* as well. The Persian technique (of asserting and erasing the narrative) becomes a function necessary to amplify the effect of the virtual rooms, that is the multiplanar narrative. This is how the cross-cultural elements interweave in the narrative fabrication and become inseparable.

In *Generosity*, the cross-cultural references extend to a hint at the Algerian writer Kateb Yacine (*Generosity* 100) and the inclusion of Arabic words such as "Saha" and "hajari" (91; 51) as well as Kayble figures like

St. Augustin and the Kabyle name of the character: Thassadit Amzwar. It is also important to remind the reader that several main characters have hybrid identities, namely: Thassa (Algerian Kabyle atheist Catholic) and Taimur (half Iranian–half American).

Further Persian–Arab elements surface; *Plowing the Dark* evokes the story techniques of *One Thousand and One Nights* towards the end and adds Taimur’s story to the collection through the statement “the thousand-and-second” (*Plowing the Dark* 379). In a performance talk, “Abenteuer Tausendundeine Nacht,” at the adventure conference at the University of Munich in 2020, Claudia Ott reminds us that, apart from the one major umbrella story framing Scheherazade and Scheherayar in *One Thousand and One Nights*, the main story includes layers of stories within multiple story frames. The technique of adding stories within stories also prevails in Powers’ novels.

Your whole body rejects the evidence. Not possible. You can’t have been here that long. Time lived and time retrieved don’t match up. Those afternoons that took a year to pass shrink, in treacherous memory, to seconds. A month of them wouldn’t fill an hour. You can’t account for more than a few dozen weeks, let alone two-and-three-quarters years.

You clutch to that dead reckoning now, as if to life. Some desperately inventive internal storyteller has won you survival through your thousand-and-one nights. And now, by the terms of the old agreement, the sentence must be lifted.

But that, too, is only another fairy story: the thousand-and-second. It gives way to hundreds more, the fragmenting agonies of a world in the throes of universalizing, myths and fables that do not say why in the world they need you as protagonist...

At least America remembers you; that much you could not have invented. Your picture in the *Herald Tribune*, even now, after so long you have almost forgotten yourself. They will want a full account, should you live to tell. They will want a book, a story, even though there is no story. There is nothing but a pointlessness the size of eternal time. (*Plowing the Dark* 379–380)

The reference to *One Thousand and One Nights* stresses survival through storytelling and narrative. In the case of Scheherazade, her rebellion against Sultan Scheherayar is performed through storytelling, which is meant to prevent him from killing one woman per night, including herself. The reference to Scheherazade (i.e., *One Thousand and One Nights*) also recurs in *Generosity* with the specific line told at the end of every story related to the Sultan to keep him hooked and to keep her alive: “What is this tale, compared to the one I will tell you *tomorrow* night, if you but spare me and let me live?” (*Generosity* 147). In Taimur’s narrative plot in *Plowing the Dark*, Taimur’s survival heavily depends on the act of reading, highlighting again survival through stories. Indeed, his whole narrative plot is turned into a requisite for survival: “You clutch to that deed reckoning now, as if to life. Some desperately inventive internal storyteller has won you survival through your thousand-and-one nights. And now, by the terms of the old agreement, the sentence must be lifted” (*Plowing* 379).

Through experimenting with different plots, narrative iconoclashes, cross-cultural, and interdisciplinary elements, Powers’ novels, in turn, reverse the coin of survival through storytelling and stress a survival of the novel (storytelling) itself. Thus, Powers rethinks the death of the novel and embarks on repositioning the novel within the dynamics and processes of contemporary life.

As mentioned before in chapter 6, *Plowing the Dark* traces an evolution of the narrative. First, it suggests a possible evolution of narrative construction from prehistoric cave drawings (the Lascaux caves, which in turn allude to Chauvet-Pont-d’Arc). Second, hinting at Plato’s allegory reveals story fabrication through the shadows in the cave. Going forward, stories appear, in the form of allegories, in religious scriptures, which were then written. Before writing, literature took the shape of oral storytelling of short stories or the reciting of lyrical poetry and odes in ancient civilizations. Oral storytelling evolved to the form of written collected stories. *One Thousand and One Nights* is considered to be the first attempt at collecting different stories under the umbrella of a larger framework and in written format. The hint at *One Thousand and One Nights*, along with the Persian storytelling techniques, marks, therefore, the possible traceability of the origin of the novel to the Persian

framed story of Scheharazade.¹³² Reference is also given to Cervantes' *Don Quixote*, rather than the Anglo-Saxon tradition of ascribing the first novel to Daniel Defoe's *Robinson Crusoe*.¹³³ Powers, thus, digs far back into history and into other civilizations as well as their cultural products to revise the evolution of writing and to explore beyond the Anglo-Saxon origin of the novel. *One Thousand and One Nights* could also be considered an encyclopedic narrative, preceding Dante's *Divine Comedy*. A thorough study has to be done to confirm this, however, this argument explains its recurring reference in Powers' novels.

Plowing the Dark catalogs the evolution of different forms of art that cross-fertilize and, in turn, the evolution of the novel as a genre by impacting the narrative techniques and literary movements. All of Powers' aforementioned novels upgrade mythology and allegory in the context of digital perspectives: for example, Implementation Helen is an upgrade of Galatea in artificial intelligence version, the Cavern is an upgrade of Plato's allegory of the cave. Additionally, in *Galatea 2.2*, evolution in literary practices traces the shift from new criticism to critical theory and then to digital humanities. Here, considerations of the literary canon also shift to minor literatures, as seen in the debate between Rick and the student, A. Hence, the evolution of the novel also shifts the balance towards the non-canon. Furthermore, the novel evolves through the different artistic and literary movements: realism, modernism, postmodernism, and post-postmodernism. Consequently, it navigates practices of representation, self-representation, and anti-representation, and it incorporates a hybrid of antiquity, realism, modernism, and postmodernism.

Writing develops simultaneously through the different practices of minimalism and encyclopedic knowledge. Powers' inclination towards the latter format, in the information age, updates the overload of infor-

132 For an elaborate discussion on the evolution of writing and art, compare Martin Puchner's *The Written World* and Brian Boyd's *On the Origin of Stories*.

133 One could also argue that Ibn Tufail's philosophical novel, *Hayy Ibn Yaqdhan* (حي ابن يقظان) *Alive, Son of Awake* is the first novel, written in the 12th century in Al-Andalus. However, it is important to keep in mind the pitfalls of pinning origins instead of revising them. The aim is to draw attention to the civilizational and cultural diversity and to rethink the variations of "origins."

mation and fields to fit contemporary academic programs that resumed interdisciplinary research in the past three decades. Powers' novels do not come as the final stage but as part of the exponential trend in relation to the evolution of writing. They further build on the traditions of the encyclopedic narratives and world literature—among others, and they evolve into the post-postmodern condition by putting interdisciplinarity into perspective. Nonetheless, Powers' novels do not mark an origin, neither do they mark an end. They are further connections, paving the way to emerging genres, and they are aware of their implication in such evolutionary patterns. Thus, the interdisciplinary structure allows for the novel's multiplanar plasticity that is open to change. It allows the novel to engage in interdisciplinary dialogue and emerging dynamics that affect the contemporary life. Hence, it evolves into the post-postmodern and beyond. Rather than stagnating, the novel, therefore, survives within the era of scientific and technological breakthroughs. In the future, these will be more visible in the parallel influences of transdisciplinarity and of the global impacts of the COVID-19 pandemic.

9.2 Elements of Interdisciplinarity

The co-existence of different disciplines in Richard Powers' novels (seen in a more in-depth analysis of *Plowing the Dark*) invites us to reflect on the cross-fertilization between the disciplines and the emerging nascent fields. *Plowing the Dark* places the different disciplines in a superimposed manner to test their combinations and new outcome. The superimposed disciplines are, therefore, entangled in iconoclasm influences and modes of artificial evolutions. The novel encompasses, and examines, diverse discourses and components from several fields. It exposes interferences of VR recreation in CAVE systems, art re-production, architectural modeling, and icon cultivation. In parallel, it tackles various forms of wars and conflicts. The references to the Hagia Sophia show highly interdisciplinary elements in the architectural design and decor, which range from optics, acoustics, and aesthetics to the shifting discourses of iconoclasm. The reproduction and reconstruction of the Hagia Sophia in the CAVE technology further amplifies the interdisciplinary interconnections. Hence, Powers' novels not only incorporate

disciplines, but they focus on interdisciplines, especially genomics, biotechnology, cognitive neuroscience, machine learning, digital humanities, Middle-Eastern studies, interfaith theology, art history, and CAVE systems. In accordance with the interdisciplinary plurality, the novel fashions a continuous dialogue and evolution of discourses, interdisciplines, and artifacts through the prehistoric, antique, medieval, modern, and postmodern trajectories.

Indeed, the choice of architectural prototyping in *Plowing the Dark* is not mere chance. Architecture is a field at the intersection and intermix of engineering and the arts. At the same time, the Hagia Sophia brings art history into perspective. Furthermore, on the link between virtual reality and architecture, Mark C. Taylor points out, in his book *Rewiring the Real*, that Virtual Reality was initially an attempt to “simulate architectural spaces” (*Rewiring* 82). As demonstrated in *Plowing the Dark*, the Cavern amplifies the interdisciplinary exchange by bringing together IT engineers, poets, painters, mathematicians, and architects on the one hand, and, on the other hand, it amplifies the literary–technological iconoclasm in *Plowing the Dark*’s narrative structure as seen in chapter 6.

The interconnection between the architectural space, drawing, spirituality, and optics has already been established in association with Plato’s cave allegory. Socrates’ analysis, beyond the cave allegory in Book 7, is a discussion over which “discipline” is crucial in discovering Truth. In *Plowing the Dark*, an echoing discussion on disciplinary importance is held between the characters working on the virtual environment Cavern; however, not to discover an absolute truth, but to create virtual prototypes of original paintings.

[...] Artists and engineers drifted through the room as Steve’s shapes spun in space. Each time his right pinkie hit the Enter key, the screen turned into a luscious spirograph, pouring forth a petaled profusion.

Lunettes, Michael Valgamott, the architect, called. *Spandrels. Tracery.* Adie heard, in the man’s voice, a fellow displaced Gothamite. Valgamott’s manic, twitching fingers ticked off the terms as if he were stepping into a crowded midtown intersection to hail a thesaurus.

The words he used made the mathematician Ari Kaladjian's bushy eyebrows balkanize. *They're properly called cardioids and tricuspids and folia. Limaçon of Pascal. Plane algebraic geometry has been making these curves for at least two hundred years.* Kaladjian had fled the globe's chaos for the safety of mathematics, and he did not care to surrender his sanctuary to fuzzy-mindedness.

Spiegel quit his keyboard jabbing long enough to shrug. *Call them what you want. They're graphics primitives. All art is Euclid!*

[...]

Kaladjian grunted. *Everything starts with equations. (Plowing the Dark 33-34)*

The argument between the characters revolves around which discipline—architecture or mathematics—provides the basic tools for drawing a leaf. While Steve dismisses the whole discussion by claiming all art to have emerged from the laws of optics, Adie does not agree to the mathematical and algorithmic rendering of visual art. For her, the geometric leaf is rigid, distorted, and divested of its complex dimensions. The passage reads as follows:

She frowned at his [Steve's] geometric petals. *But where's the leaf? I see nothing that even faintly resembles the Rousseau I showed you. At best, they look like victims of a hit-and-run Calder mobile.*

That's what you lose when you generate leaves by algorithms. Everything's a trade-off. In this case, you trade off natural complexity for something that's easier and faster...and much too geometrical. Much too perfect. [...]

Where are the shadows and gradations? Adie sounded betrayed. (34)

As the Cavern's team members discuss which discipline (mathematics, architecture, optics, coding, or art) is more valuable to draw a leaf, the dialogue evokes the absurdity of the debate. It exposes how they are all complementary and necessary in order to render complexity.

A similar platform for interdisciplinary combinations exists in *Galatea 2.2*. The example, however, takes a larger scale than the conversation in the Cavern in the Realization Lab in *Plowing the Dark*. *Galatea 2.2* brings forth the Center for the Study of Advanced Sciences at U., where the character Rick is appointed. The center, indeed, promotes hybrid fields and interdisciplinary research, so the stress on interdisciplinarity becomes even more obvious in the following passage:

Work at the Center divided into areas so esoteric I could not tell their nature from their names. Half the fields were hyphenated. Creative play spilled over borders, cross-pollinating like hybrid corn in heat. Talk in its public spaces sounded like a UN picnic: excited, wild, and mutually unintelligible [...]

Most attention converged on complex systems. At the vertex of several intersecting rays—artificial intelligence, cognitive science, visualization and signal processing, neurochemistry—sat the culminating prize of consciousness's long adventure: an owner's manual for the brain. With its countless discrete and massively parallel subsystems, the Center seemed to me a block-wide analog of that neuronal mass it investigated. (*Galatea 6*)

In this respect, *Galatea 2.2* reflects on how the interdisciplinary center and research appear as a simulation of neuronal networks. Moreover, it establishes how the fluidity in the fields advances cognitive malleability. Rick ponders:

Every sentence, every word I'd ever stored had changed the physical structure of my brain. Even reading this article deformed the cell map of the mind the piece described, the map that took the piece in.

At bottom, at synapse level, I was far more fluid than I'd ever suspected. As fluid as the sum of things that had happened to me, all things retained or apparently lost. Every input to my associative sieve changed the way I sieved the next input. (*Galatea 56*)

This statement on the cognitive change through exposure to interdisciplinarity represents the core of how Powers' novels intend to provoke cognitive malleability and connectedness through their interdisciplinary structures. Hence, *Galatea 2.2* integrates artificial intelligence, *Plowing the Dark* engulfs CAVE systems and art history, *The Echo Maker* deals with cognitive neuroscience, and *Generosity: An Enhancement* encompasses genomics (biomedicine and biotechnology).

By bringing various fields together, Powers' novels explore the accumulative impact of interdisciplinary knowledge. Powers' fiction uses the interdisciplinary network to trace, and provoke, exponential growth in knowledge and inventions. The novels also reveal conflicting and complementary theories within each discipline and across the different (inter-)disciplines. As a result, the different theories highlight cross-fertilization and a paradigm shift in methods, tools, and techniques. The entanglement, fluidity, and exponential growth of knowledge reveal constant transformation and evolution of the fields. If one trend or discipline fixes itself in sovereignty of access to absolute logic or absolute truth, knowledge becomes hostage to non-critical thinking and to stagnation. The same happens to literature, and the novel, when kept in total literary and fictional isolation.

9.3 The Urge: What is Next?

Through their challenging and experimental structural and thematic components, Powers' novels repeatedly invoke the question: "What is the future of the novel as a genre?" The question emerges following every narrative choice made by bringing technological, scientific, cognitive, and civilizational aspects to the platform of literature. The question is equally raised by offering a peek into the nascent scientific and technological fields, which focus on emerging concerns around the ways groundbreaking technologies increasingly affect humanity and contemporary life. Powers is alarmed by the pace of evolution of the sciences and technologies in an era of mass production as the novel may lag behind if not kept up to date with the emerging and evolving dynamics.

The novel as a literary form can become obsolete if not upgraded and if the techniques of writing are not revised. The first paintings, music,

and novel (*The Road*) produced by AI have already come to existence, even though in a crude form (Hornigold). *The Singularity*, as Hornigold explains, is “a growing subgenre” of human–machine music, or as he puts it, is a form of human–machine collaboration (“The First Novel”). The replication of human creativity by AI reaches a new level. Although at this point the attempts are still far from perfection, they announce a new era that is yet to come. Hallam Stevens, Bo An, Pham Cuong, and Justin Dauwels express skepticism when it comes to the Kurzweilian extreme of the Singularity, due to the tedious work involved in machine learning and its insufficient intelligence (Personal Interviews). They all warn against the pitfalls of extreme promises or exaggerated fear. At the same time, Justin Dauwels stresses that, with the introduction of deep neural networks, AI systems have recently pushed remarkable progress, especially in machine translation, language and facial recognition systems, and robotics (Personal Interview).

The intersection of artistic performance and technology is a technique that characterizes some other artists’ work, as also mentioned in the beginning of part III. When it comes to the “videoplace” of E. Tannenbaum’s “Recollections” dance performance,¹³⁴ Tannenbaum explains that the connection or dependence of art on technology has always been visible; for instance, in the use of chemical colors in painting (Tannenbaum “Recollections”). He argues that, in most cases, artists dread technology and scientists dread to make art, and he advocates that “if you cross that boundary, miraculous things can happen” (Tannenbaum “Recollections”).

Apart from other disciplines, Powers uses collaboration between literature and technology in his novels with the absolute consciousness of the “miraculous” effect of the mix, producing a novel form that partly functions through literary–technological iconoclashes. As discussed in detail in chapter 6, the CAVE-like structure of *Plowing the Dark* amplifies stereoscopic immersive and interactive narration in full scale, where the novel becomes virtual and technological through mixed

134 E. Tannenbaum’s “Recollections” are referenced by Cruz-Neira as an example of a VR application in art installation that targets viewer’s “body representation” (Cruz-Neira, “CAVE Audio Visual” 68). I use the reference here to highlight the use of technology in art.

reality. This generates superimposition of literary–technological features and functions. Technological–literary iconoclasm is also present in *Galatea 2.2* through the use of computer science coding language in naming the characters and the prevailing use of machine learning theories. In *Generosity*, it is captured through the genomic network and human genome editing that develop into a mysterious unfolding of events towards the end of the novel. In *The Echo Maker*, it appears briefly in the technology used in brain surgery and life machines. In *The Echo Maker*, technological–literary iconoclasm occurs through Richard Powers’ method of writing the novel via a speech-to-writing software. Here, Powers orally dictates the story to the tablet, which, in turn, transforms the narrative into a written text, marking an instance of “Singularity” through machine speech recognition and automatic conversion of speech to text. The narratives converge as well on a mix of cognitive neuroscience and digital humanity.

While Bruno Latour calls Powers’ novels “*scientifiction*,” he admits that the label is not broad enough (“Powers of the Fascimile” 273). In his essay “Making the Rounds” in *Intersections*, Richard Powers refers to Tom LeClair’s term “systems novel,” which comes in opposition to minimalist literature (305). In addition, he points out John Barth’s concept of “maximalist fiction” and Edward Mendelson’s “encyclopedic narrative” (306). Therefore, I point out previously the awareness of Richard Powers of such genres, and I stress that his concern with these brings his fiction another step forward in synthesis of their influence and his approach to interdisciplinarity. The urge for a novel as an umbrella technology that contains all disciplines is also seen in Richard Powers’ reflections:

[...] And a person at the end of the second millennium inhabits more contexts than any specialized discipline can easily name. We are shaped by runaway technology, by the apotheosis of business and markets, by sciences that occasionally seem on the verge of completing themselves or collapsing under its runaway success. This is the world we live in. If you think of the novel as a supreme connection machine—the most complex artifact of networking that we’ve ever developed—then you have to ask how a novelist would dare to leave out 95% of the picture. (“The Last Generalist” 104)

If the novel as a genre follows the logic of shifting dynamics, its evolution constantly flirts with its possible obsolescence, and ultimately, its death as well. To avoid such an end, *Plowing the Dark*, for instance, does not offer a simulation of world navigation that is solely vertical or horizontal. Rather, it renders a multidimensional traceability of change. *Plowing the Dark* lays bare a dynamic of horizontal and vertical axes as well as historical, geographical, and interdisciplinary axes, which capture depth and malleability. These dimensions mark the need for the novel to be exponential in its growth, which again stresses the very claim of Powers: “If you think of the novel as a supreme connection machine – the most complex artifact of networking that we’ve ever developed – then you have to ask how a novelist would dare to leave out 95% of the picture” (“The Last Generalist” 104). At the limits of all connections (the temporal, the dynamic, the spatial, the intercultural, the interdisciplinary, and the exponential), the question that follows is: “what is next?” Thus Powers crafts the interdisciplinary novel *par excellence*.

9.4 The Novel as Crafted by Richard Powers

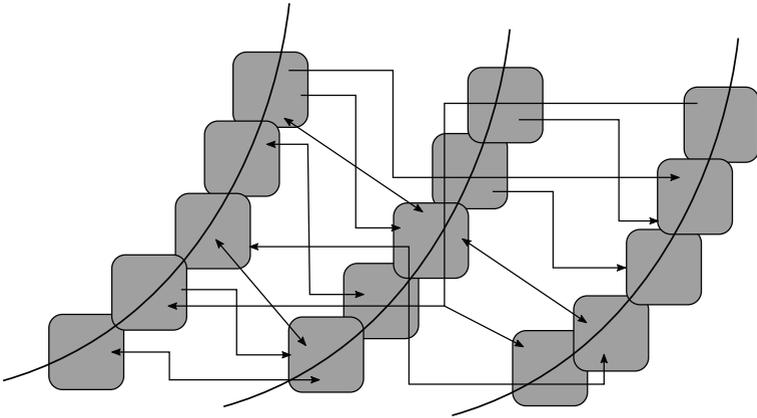


Fig. 5 The Interdisciplinary Novel: Multiplanar, Interconnected, Exponential

The narratives of Richard Powers function as a simulation of an exponential hyperbole of variables and probabilities. Such hyperbole is constructed through the following narrative techniques: the multidimen-

tional, multiplanar narrative structure; the narrative network structure; the cross-cultural elements; and experimenting with multiple scenarios. The different interdisciplines connect in an exponential and cross-fertilizing fashion. The connections multiply, based on the continuity of borrowing, reconstruction, and reconfiguration in different combinations. These involve transformations and provoke new dynamics and systems. Richard Powers uses this opportunity to stress the novel's obligation to constant innovation and to self-refashioning lest it becomes obsolete. Powers does not create the novel from scratch. Rather, he uses contemporary combinations of ideas and theories, and he mixes them with historical and traditional elements. Therefore, he reworks the ideas in different interdisciplinary, formal, and cultural contexts. He navigates time frames while making use of, and being aware of, exponential growth, artificial evolution, and nascent interdisciplinary fields. The technique creates transforming dynamics and advancements in narrative construction that develop in congruence with emerging issues. At the same time, it sheds light on the multiplicity of artifacts and their evolution. Hence, Richard Powers recreates the interdisciplinary novel, propagating interdisciplinary minds. His novels capture interdisciplinary thought and thinkers on the one level. On a cognitive metalevel, they push the reader's cerebral plasticity into directions of interdisciplinary interconnectedness and exponential trends.

By so doing, the novel as crafted by Richard Powers does not mirror the brain. The novel as crafted by Powers simulates several minds over human history. It targets knowledge production and the direct, or indirect flow, which leads to the proliferation of interdisciplinary conversations. It adopts a *longue durée* and cross-civilizational method to explore the varieties of artifacts. These operate within, and excavate, the dynamics of artificial evolution and iconoclasm (including, iconoclastic measures) in terms of breaking, deforming, restoring, and preserving. Thus, they capture and cause paradigm shifts. Juggling the disciplines opens up interactive and immersive contact with knowledge and artifacts within the freedom of 360 degrees. At the same time, it signals the pitfalls of over-explanation and impasse. The interdisciplinary approach points out the impossibility of reaching a full picture due to the persistence of blind spots. In this sense, the interdisciplinary novel

does not aim at exhaustion. Through the novel's interdisciplinary dialogue and emerging systems, the novel evolves into the post-postmodern condition and beyond, contaminated by the aspects it explores.

The interdisciplinary novel, as Richard Powers constructs it, lends itself as a fluid multi-channeled structure, which is imprinted by changing layers of disciplines and interdisciplines. While it deploys a malleable and chameleonic structure, the novel lets itself become infiltrated by the different evolutionary trajectories, and it allows itself to evolve all along. Richard Powers' novel, which opens up its narratives to be imprinted by science and technology, does not appear as science fiction. It juggles nascent interdisciplinary fields with innovative narrative structures so that it remains in the pool of current advances and does not become obsolete in the age of scientific and technological mass developments. It, thus, navigates interdisciplinary complexes that enable it to survive, regenerate, and evolve. In this respect, it stays up to date as it infiltrates, and as it is imprinted by, other disciplines, interdisciplines, and emerging dynamic systems.

Conclusion

My analysis of the four novels of the American author Richard Powers—*Galatea 2.2* (1995), *Plowing the Dark* (2000), *The Echo Maker* (2006), and *Generosity: An Enhancement* (2009)—reveals important findings at the thematic and structural levels. This is achieved through a mixed method that encompasses a diverse theoretical background from different disciplines and cultures. The method exposes interdisciplinarity in the novels, which emphasizes the interconnectedness between the scientific, technological, cognitive, and civilizational aspects of contemporary culture. My work, therefore, addresses modes of artificial evolution, revealing how interdisciplinarity is an essential structure for the evolution of writing, especially in an era of exponential progress in technology and science.

The book is divided into three major parts: the first part focuses on artificial evolution, i.e., the pursuit of enhancement through human genetic engineering, cognitive malleability, and artificial intelligence; the second part tackles civilizational evolution through restraint and variations; and the last part explores artistic evolution as a case of iconoclasm through interdisciplinary thought.

In part I, I examine *Generosity: An Enhancement*, *The Echo Maker*, and *Galatea 2.2* and identify three major modes of artificial evolution (biological and non-biological). The first mode is revealed in the promise of curing sadness by means of germline genome modification, which is expressed through the theories and experiments promoted by the genomicist Kurton, reality TV show debates, and Thassa's exceptionally elated mood. The first chapter demonstrates indecision over the futuristic project. It demonstrates a complexity of the emotional network along with the danger and hype of germline engineering.

Artificial evolution in *The Echo Maker* surfaces following Mark Schluter's traffic accident, in the form of his rescue and survival via scientific and technological methods and tools. These appear as life machines and surgical interventions on the brain. A shift in methods of treating Mark's syndrome of the doubles—Capgras syndrome—reveals a split between the psychic diagnosis and physical (cognitive neuro-

science) approaches. The novel also sheds light on the rupture with the black box theory of stimulus–response. In the light of Edward Tolman’s theory of cognitive mapping and V. S. Ramachandran’s studies of the neurological aspects of Capgras syndrome, brain architecture is revealed as complex, plastic, and malleable. Mind simulacrum, in this case, is, therefore, addressed through Mark’s syndrome of the double and, his sister, Karin’s disturbed self-consciousness.

The third mode of artificial evolution is non-biological, and it resides in machine learning through deep neural networks, as seen in Implementation Helen in *Galatea 2.2*. The bet to recreate the human brain reveals debates around Alan Turing’s imitation game, where the humanist Rick and the engineer Lentz disagree on the degrees of imitation. Here, the paradox of mimesis is studied through Walter Benjamin’s “the mimetic faculty” and Michael Taussig’s concept of “alterity” to achieve a notion of the alterity faculty that aligns with Ray Kurzweil’s theory of exponential growth and the Singularity. Machine malleability, therefore, fosters the idea of critical thinking machines through interdisciplinary knowledge.

In part II, I continue the discussion over evolution in light of civilizational rise and fall, and the concept of restraint. Here, variations are explored in terms of the hybrid identities of the characters in *Generosity: An Enhancement* and *Plowing the Dark*. Samuel P. Huntington’s theory of the clash of civilizations is further debunked through the examination of the various conflicts between groups of the same identity (i.e., groups of the same religion, ethnicity, or nation). While *Generosity: An Enhancement* reveals civilizational changes that date back to the ancient history of Carthage and Rome, extending to modern history and encompassing the Civil War in Algeria, *Plowing the Dark* lists the Lebanese Civil War, the Iran–Iraq War, Iraq’s invasion of Kuwait, and focuses on the Persian Gulf War. Here, regress despite technological progress is tackled in relation to the virtual. My analysis of the virtuality of the Persian Gulf War relies on a Baudrillardian sense of the hyperreal and spectacular via sophisticated smart weaponry, real-time broadcasting, hostage crisis, and terrorism. In this context, *Plowing the Dark*’s narrative offers an antiaesthetics of war.

Part III analyzes the narrative structures of *Plowing the Dark* to exemplify elements of artistic evolution that are equally visible in the aforementioned novels. My analysis deploys Bruno Latour's concept of "iconoclash" in different combinations, emphasizing literary–technological iconoclash, architectural–literary iconoclash, and religious iconoclash. The novel tackles the evolution of art and image construction from cave drawings to the CAVE—a computer automatic virtual environment. In parallel, *Plowing the Dark's* narrative simulates the CAVE's immersive and interactive, multiplanar environment. This is achieved through the 3D stereoscopic narrative construction, immersion and intrusion, narrating in full scale, and narrating in sync. The narrative structure, therefore, adopts literary–technological iconoclash. On the other hand, architectural–literary iconoclash occurs in *Plowing the Dark's* narrative in analogy to the complex exterior and interior design of the Hagia Sophia. Both the novel and the architectural fashion superimpose strata of diverse civilizational, disciplinary, and interdisciplinary elements. These elements clash, overlap, and cross-fertilize in patterns of iconoclasm and iconoclash. The dilemma of prototyping the Hagia Sophia in the virtual environment stresses the complexity of the Hagia Sophia and virtual archiving/reconstruction.

In addition, the virtual environment Cavern fosters the fluidity of space, with which the novel experiments at different levels of the virtual rooms. The VR Hagia Sophia reveals the impact and evolution of optics and acoustics—via virtual reality, virtual acoustics, and augmented space. These build on Hagia Sophia's aesthetics of glitter and reverberations as explored by Bissera V. Pentcheva. The aspects of fluidity in *Plowing the Dark* render its narrative structures "chameleonic" and "liquescent"—to use Pentcheva's terminology. The narrative simulates the superimpositions and artificial imprints, creating a multiplanar, multidimensional, immersive, and interactive structure. The superimposed structures and elements carry on in the religious–literary iconoclash, where the novel explores the aesthetics of the Qur'an and the manifold usages of the scripture. These create a conversational function and reveal diverse aspects of scripture cultivation in similar ways to the image/icon. The analysis emphasizes multiple symbolisms of the cave and multiple strata of intercultural and interdisciplinary scope.

All the elements ultimately serve to explore the novel as crafted by Richard Powers with interdisciplinarity as its major structure. Such is my approach, having reflected on the experimental narrative constructions of Richard Powers' *Galatea 2.2*, *Plowing the Dark*, *The Echo Maker*, and *Generosity: An Enhancement*. These four novels mark an artistic-literary evolution of the art in ways that keep up to date with the era of technological and scientific mass production and advancement. Their structure is chameleonic and liquescent, imprinting the narratives with diverse cultural elements and disciplines, creating a multiplanar and multidimensional space in similar ways to the CAVE technology. Powers' novels are multi-structural, and impregnated with interdisciplinary iconoclashes. In addition to transforming, clashing, and overlapping, these structures evolve artificially—in and out of sync—with technological and scientific breakthroughs, historical and political patterns, as well as aesthetic and artistic movements.

The novel, therefore, touches on various elements from different interdisciplinary and hybrid fields. It allows its structures to be porous, absorbing the variations of disciplines and interdisciplines, which create superimposed strata in new combinations and connections. These form an interdisciplinary novel, renewable like an engineered virtual space. Powers' novels do not exist in isolation from global and disciplinary discourses and dialogues, they function within the core of these paradigms, connecting the reader to more and more spheres of existence that reveal an infinity of space and thought along with blind spots. Powers' narrative structures stimulate the reading brain in all directions and expand its malleable scope. However, this has to be supported by an active understanding of the patterns, which bring the importance of interactivity to the fore. Therefore, I opt for a method that is cross-cultural and interdisciplinary to better reveal the complexity of Powers' novels.

Although my approach to analyzing Powers' novels addresses multiple aspects from different interdisciplinary fields and relies on theories from different cultures and disciplines, my analysis remains non-exhaustive. The multidimensional structures of Richard Powers' novels invite further research, and my analysis equally encourages future considerations in relation to Richard Powers' novels and to "what's next?"

in the humanities. In future research, or as a possible continuity of the conversation, it would be interesting to investigate other modes of evolution, present in Powers' novels. In addition, it would be important to explore other interdisciplinary connections, which are visible through Powers' treatment of music and musicology, capitalism, and environmental issues. Another dimension to explore in detail would be an in-depth study of Richard Powers' novels within the framework of post-postmodernism. Further analysis of Powers' novels could also draw on Andrew Frederick Allen's analysis of "an ethical dominant" in post-postmodern literature.

Within the framework of "what's next?" in the novel and in literature, future research could address how future American literature will deal with the COVID-19 outbreak and its implications for the world, the United States, and the individual. Would the new conditions of the pandemic (global confinement and social distancing) shape literature differently? How would the form and content develop in alignment with the new situation? Would future literature grow even more interdisciplinary as the world witnesses equal urgency across all fields during the pandemic? Or would it become extremely minimalistic because of the lockdown and confinement?

For such investigations, it would be important to take into consideration the surge in digitalized practices; the intense virtual globalization of shared fears, responsibilities, and challenges, along with instant politics and uncertainties. These include the closure of national and regional borders, the suspension of air traffic, leading to a drastic hindrance of human mobility. Since the pandemic, social behavior has shifted to the home office or self-isolation. Businesses and education have been suspended, have migrated online, or have adopted new safety measures to avoid health disasters. The world has witnessed confused health organizations and institutions in addition to politically uninformed decisions with no, or very limited, readiness for this most unprecedented global crisis of contemporary times. The dilemma of lockdown, suspension of businesses, and closure of borders has intensified against the backdrop of financial precariousness, possibly causing recession, but also catastrophe at the individual level. These interfere not only with infected patients but encompass people who have

filed for bankruptcy and have suffered mental health issues, leading in some cases to suicide and isolation in totally locked-down societies. The dilemma over the infringement of personal freedom has increased in the face of the deployed technology and robotics, reinforcing policies of social and physical distancing through surveillance methods.

Daily broadcasts and online platforms have been displaying the exponential rates of death and infection by the day, and by the country or region. Political, financial, and public health measures have daily affected public opinion and behavior, apart from the constant coverage of pandemic developments on TV and online. The race to develop a vaccine and effective treatments has underscored the need for topline research centers and strong medical systems—such awareness is further fused with the shock of the lack of sustainable medical infrastructure and the collapse of institutions due to the failure in managing the crisis. The race for the mass production of healthcare equipment and life support machines has equally dominated the scene. When breathing and human contact endangers humanity, radical changes in lifestyle, freedom, and space suddenly occur—and technology becomes even more crucial to every aspect of our lives.

The question is how all of these dynamics will affect the forms of future cultures and literature and whether they would propel a new trend of post-COVID-19 and offer an after post-postmodernist model. The world has grown more and more enmeshed in every sense of the term. Although Richard Powers has already experimented with the notions of virtuality, digitalization, confinement, isolation, and the connectivity of disciplines, it will be interesting to see how his next novels will further evolve in alignment with the new global and national conditions—especially in the intensification of isolation and interdisciplinarity.

Bibliography

- Ajami, Fouad. "The Summoning: 'But They Said, We Will not Hearken'" (1993). *The Clash of Civilizations? The Debate*. NY: Foreign Affairs, 1996.
- "Algeria, by Force of Islam." *BBC Assignment Series*, 1991. <https://www.youtube.com/watch?v=vm05XauePOc>. Accessed 20 May 2019.
- Allen, Andrew Frederick. "After Postmodernism: Ethical Paradigms in Contemporary American Fiction." Munich, Mar. 2018. Unpublished Dissertation.
- Allenby, Braden R. and Daniel Sarewitz. *The Techno-Human Condition*. Cambridge/London: MIT P, 2011.
- Amara, Tarek and Mohamed Argoubi. "Marche contre le terrorisme à Tunis, après l'attaque du Bardo." *Reuters*, 29 Mar. 2015. <https://www.reuters.com/article/ofrtp-tunisie-violences-idFRKBNOMPOC420150329>. Accessed 28 Oct. 2021.
- Anthony, Martin and Peter L. Bartlett. *Neural Network Learning: Theoretical Foundations*. Cambridge UP, 1999.
- Aristotle. *Poetics*. Trans. Stephen Halliwell. Harvard UP, 1995, pp. 1–142.
- Armitage, John. "The Kosovo W@r did Take Place." *Virilio Live: Selected Interviews, Theory, Culture & Society*. Ed. John Armitage. London: SAGE Publications Ltd, 2001, pp. 167–198. DOI: <https://doi.org/10.4135/9781446220306.n13>. Accessed 7 July 2020. Accessed 7 July 2020.
- Aupers, Stef. "'Trust No One': Modernization, Paranoia and Conspiracy Culture." *European Journal of Communication*, vol. 27, no. 1, 2012, pp. 22–34. DOI: <https://doi.org/10.1177%2F0267323111433566>. Accessed 10 Jan. 2018.
- Basarab, Nicolescu. "Multidisciplinarity, Interdisciplinarity, Indisciplinarity, and Transdisciplinarity: Similarities and Differences." *RRC Perspectives*, vol. 2, 2014: 19–26. Permalink: <https://www.jstor.org/stable/10.2307/26241230>. Accessed 24 June 2020.
- Bataille, Georges. *Lascaux or the Birth of Art*. NY: Macmillan, 1980.
- Baudrillard, Jean. *L'esprit de terrorisme*. Paris: Galilée, 2002.
- . *La guerre du Golfe n'a pas eu lieu*. Paris: Galilée, 1991.
- . *Simulacra and Simulation*. Trans. Sheila Faria Glaser. Michigan: Ann Arbor U of Michigan P, 2008.

- . *Simulacres et simulation*. Paris: Galilée, 1981.
- . *The Spirit of Terrorism and Other Essays*. Trans. Chris Turner. London/NY: Verso, 2003.
- Beer, Gillian. *Darwin's Plots: Evolutionary Narrative in Darwin, George Eliot and Nineteenth-Century Fiction*. 3rd ed. Cambridge UP, 2010.
- Benesch, Klaus. "In the Diaspora of Words: Gaddis, Kierkegaard, and the Art of Recognition(s)." *Paper Empire: William Gaddis and the World System*. Ed. Joseph Tabbi and Rone Shavers. Tuscaloosa: U of Alabama P, 2007, pp. 29–45.
- Benjamin, Walter. "Doctrine of the Similar (1933)." *New German Critique* 17 (Spring 1979): 65–69. Trans. Knut Tarnowski. Permalink: <https://www.jstor.org/stable/488010>. Accessed 11 Dec. 2018.
- . "On the Mimetic Faculty (1933)." *Walter Benjamin: Selected Writings, 1931–1934*. Ed. Michael W. Jennings. Trans. Edmund Jephcott. Vols. 2, Part 2. Massachusetts: The Belknap P of Harvard U, 2005. 720–722.
- . "The Work of Art in the Age of Mechanical Reproduction." *Technology and Culture, the Film Reader*. Ed. Andrew Utterson. London/NY: Routledge, 2005.
- Bennison, Amira K. *The Great Caliphs: The Golden Age of the 'Abbasid Empire*. New Haven/London: Yale UP, 2009. *Proquest*. <http://ebookcentral.proquest.com/lib/ub-lmu/detail.action?docID=3420516>. Accessed 18 May 2020.
- Berger, Kevin. "Richard Powers, The Art of Fiction No. 175." *The Paris Review*, no. 164, 2002. <https://www.theparisreview.org/interviews/298/the-art-of-fiction-no-175-richard-powers>. Accessed 6 Aug. 2014.
- Bernstein, Jay Hillel. "Transdisciplinarity: A Review of Its Origins, Development, and Current Issues." *Journal of Research Practice*, vol. 11, no. 1, 2015, pp. 1–20. AU P Canada. <http://jrp.icaap.org/index.php/jrp/article/view/510/412>. Accessed 15 June 2020.
- Bhushan, Bharat. *Biomimetics: Bioinspired Hierarchical-Structured Surfaces*. 3rd ed. Springer Series in Materials Science, 2012.
- Biegler, Paul. "Leaps and Boundaries: The Rise of China as a Science Superpower." *The Sydney Morning Herald*, 23 June 2019. <https://www.smh.com.au/world/asia/leaps-and-boundaries-the-rise-of-china-as-a-science-superpower-20190612-p51wto.html>. Accessed 19 Nov. 2019.

- Binyan, Liu. "Civilization Grafting: No Culture Is an Island" (1993). *The Clash of Civilizations? The Debate*. NY: Foreign Affairs, 1996.
- Bouazzaoui, Chaimane. "Tunisia: An International March Against Terrorism." *Morocco World News*, 30 Mar. 2015. <https://www.morocco-worldnews.com/2015/03/155169/tunisia-international-march-terrorism>.
- Boukhchim, Nouri, Tarek Ben Fraj and Emmanuel Reynard. "Lateral and 'Vertico-Lateral' Cave Dwellings in Haddej and Guermessa: Characteristic Geocultural Heritage of Southeast Tunisia." *Geoheritage*, 25 July 2017: 575–590. DOI: <https://doi.org/10.1007/s12371-017-0251-2>. Accessed 4 May 2020.
- Boyd, Brian. *On the Origin of Stories: Evolution, Cognition, and Fiction*. Cambridge/London: First Harvard UP, 2009.
- Byrne, Rhonda. *The Secret*. NY: Astria Books, 2006.
- Capgras, Joseph and Jean Reboul-Lachaux. "L'illusion des 'sosies' dans un délire systématisé chronique." *Société Clinique de Médecine Mentale*, vol. 11, 1993, pp. 119–133. DOI: <https://doi.org/10.1177/0957154X9400501709>. Accessed 31 Jan. 2018.
- Cervantes Saavedra, Miguel de. *Don Quixote*. Trans. John Ormsby. Cham-pagin, III: Project Gutenberg, 199–.
- Chan, Chiu-Shui, John Maves, and Carolina Cruz-Neira. "An Electronic Library for Teaching Architectural History." *Architecture Conference Proceedings and Presentations*, 37, 1999. https://lib.dr.iastate.edu/arch_conf/73. Accessed 22 Jan. 2020.
- Chan, Chiu-Shui, Lewis Hill and Carolina Cruz-Neira. "Is it Possible to Design in Full Scale?" *Architecture Conference Proceedings and Presentations*, 64, 1999, pp. 43–52. https://lib.dr.iastate.edu/arch_conf/64. Accessed 22 Jan. 2020.
- Chauvet2, Caverne du Pont d'Arc*, Ardèche, France. Personal Visit, September 2020.
- Cruz-Neira, Carolina. "Making Virtual Reality Useful: A Report on Immersive Applications at Iowa State University." *Future Generation Computer Systems*, 1998, pp. 147–155. DOI: [https://doi.org/10.1016/S0167-739X\(98\)00017-X](https://doi.org/10.1016/S0167-739X(98)00017-X). Accessed 22 Jan. 2020.

- Cruz-Neira, Carolina, et al. "The Cave: Audio Visual Experience Automatic Virtual Environment." *Communications of the ACM*, vol. 35, no 6, June 1992, pp. 64–72. DOI: <https://doi.org/10.1145/129888.129892>. Accessed 22 Jan. 2020.
- C-SPAN. "U.S. CENTCOM Military News Briefing." *War in the Middle East: U.S. Military Briefing*. Prod. C-SPAN, Riyadh, 30 Jan. 1991. <https://www.c-span.org/video/?16102-1/us-centcom-military-news-briefing>. Accessed 10 Apr. 2019.
- Damasio, Antonio. "Am Anfang war die Emotion." U of Munich: Talk Series: Politics of Emotion: Power of Affect, 2 Nov. 2017. Talk.
- Dark, Ken and Jan Kostenecec. *Hagia Sophia in Context: An Archaeological Re-examination of the Cathedral of Byzantine Constantinople*. Oxford/Philadelphia: Oxbow Books, 2019.
- Darwin, Charles. *On the Origin of the Species*. KY: Lexington, 2013.
- . *The Expression of the Emotions in Man and Animals*. London: John Murray, 1872.
- Descartes, René. *Les passions de l'âme—Die Leidenschaften der Seele*. Hamburg: Felix Meiner Verlag, 1984.
- Dewey, Joseph. *Understanding Richard Powers*. Columbia: U of South Carolina P, 2002.
- Doudna, Jennifer A. and Samuel H. Sternberg. *A Crack in Creation: Gene Editing and the Unthinkable Power to Control Evolution*. NY/ Boston: Houghton Mifflin Harcourt, 2017.
- Draaisma, Douwe. "Echos, Doubles, and Delusions: Capgras Syndrome in Science and Literature." *Style*, vol. 43, no. 3, Fall 2009, pp. 429–441. https://www.researchgate.net/publication/289802932_Echos_Doubles_and_Delusions_Capgras_Syndrome_in_Science_and_Literature. Accessed 12 Aug. 2014.
- "Ecocampus: The Hive." *Nanyang Technological University Singapore*, 2020. <http://ecocampus.ntu.edu.sg/Pages/The-Hive.aspx>. Accessed 4 Apr. 2020.
- Ellis, Hadyn D., Angela H. Quayle., and Andrew W. Young. "The Emotional Impact of Faces (But Not Names): Face Specific Changes in Skin Conductance Responses to Familiar and Unfamiliar People." *Current Psychology*, vol. 18, no. 1, Spring 1999, pp. 88–97. DOI: <https://doi.org/10.1007/s12144-999-1018-y>. Accessed 22 Feb. 2018.

- Ellis, Hadyn D. and Michael B. Lewis. "Capgras Delusion: A Window on Face Recognition." *TRENDS in Cognitive Sciences*, vol 5, no. 6, April 2001. DOI: [https://doi.org/10.1016/S1364-6613\(00\)01620-X](https://doi.org/10.1016/S1364-6613(00)01620-X). Accessed 22 Feb. 2018.
- Elsner, Jaś. "Iconoclasm as Discourse: From Antiquity to Byzantium." *The Art Bulletin*, vol. 94, no. 3, 2014, pp. 368–394. DOI: <https://doi.org/10.1080/00043079.2012.10786048>. Accessed 09 Jan. 2020.
- Feigenbaum, Edward A. and Herbert A. Simon. "Computers in Behavioral Science." *Behavioral Science, General Systems Science Foundation*, vol. 8, no. 1, 1963, pp. 72–76. DOI: <https://doi.org/10.1002/bs.3830080109>. Accessed 13 Aug. 2019.
- Fiedler Inge, Ella Hendriks, Teio Meedendorp, Michel Menu, and Johanna Salvant. "Materials, Intention, and Evolution: Van Gogh's Bedrooms." *Van Gogh's Bedrooms*. Ed. Gloria Groom. Chicago: Art Institute of Chicago, 2018, pp. 68–98.
- Forrest, Sharita. "Richard Powers Elected to American Academy of Arts and Letters." *Illinois News Bureau*, 13 Apr. 2010. <https://news.illinois.edu/view/6367/205661>. Accessed 13 Feb. 2019.
- Frodeman, Robert, Julie Thompson Klein and Carl Mitcham. *The Oxford Handbook of Interdisciplinarity*. NY: Oxford UP, 2010. EBSCO Publishing: eBook Academic Collection.
- Future Investment Initiative. "Saudi Arabia Grants Citizenship to Humanoid Robot 'Sophia.'" *Economic Times, Riyadh*, 2017. https://www.youtube.com/watch?v=IsFv_gKS3YE. Accessed 26 Oct. 2017.
- Gaddis, William. *The Recognitions*. *Dalkey Archive*, 2012. www.dalkyarchive.com. Accessed 01 Feb 2021.
- . *J R*. 1975. Intro. Frederick R. Karl. Harmondsworth: Penguin, 1993.
- Gamboni, Dario. "Image to Destroy, Indestructible Image." *iconoclasm: Beyond the Image Wars in Science, Religion, and Art*. Ed. Bruno Latour and Peter Weibel. Karlsruhe/Massachusetts: ZKM/MIT Press, 2002, pp. 88–135.
- Goertzel, Ben. "Human-Level Artificial General Intelligence and the Possibility of a Technological Singularity: A Reaction to Ray Kurzweil's *The Singularity Is Near*, and McDermott's Critique of Kurzweil." *Artificial Intelligence*, vol. 171, no. 18, Dec. 2007, pp. 1161–1173. DOI: <https://doi.org/10.1016/j.artint.2007.10.011>. Accessed 20 Nov. 2017.

- Goertzel, Ben, et al. "Loving AI: Humanoid Robots as Agents of Human Consciousness Expansion (Summary of Early Research Progress)." 25 Sept. 2017. DOI: <https://arxiv.org/abs/1709.07791v1> [cs.AI]. Accessed 20 Nov. 2017.
- Golabek, Adam, et al. "Brain Plasticity and Environmental Enrichment in Ts65Dn Mice, and Animal Model for Down Syndrome." Rondal, Jean-Adolphe, Juan Perera and Donna Spiker. *Neurocognitive Rehabilitation of Down Syndrome: The Early Years*. Ed. Jean-Adolphe Rondal. Cambridge UP, 2011, pp. 71–84.
- "Golden Age of Radio in the US." *DPLA*, Exhibitions. <https://dp.la/exhibitions/radio-golden-age/radio-frontlines>. Accessed 5 April 2020.
- Graff, Harvey J. *Undisciplining Knowledge: Interdisciplinarity in the Twentieth Century*. Johns Hopkins UP, 2015. Proquest Ebook Central.
- Hauskeller, Michael. *Better Humans? Understanding the Enhancement Project*. Durham, UK: Acumen, 2013.
- Hill, Donald R. *Islamic Science and Engineering*. Edinburgh: Edinburgh UP, 1993.
- Hodge, Susie. *The Short Story of Architecture*. London: Laurence King Publishing, 2019.
- Höpker, Karin. "Happiness in Distress/ Richard Powers' Generosity and Narratives of the Biomedical Self." *Ideas of Order: Narrative Patterns in the Novels of Richard Powers*. Ed. Antje Kley and Jan D. Kucharzewski. Heidelberg: Universitätsverlag Winter, 2012.
- Hornigold, Thomas. "The First Novel Written by AI is Here—and It's as Weird as You'd Expect It to Be." *SingularityHub*, 25 Oct. 2018. <https://singularityhub.com/2018/10/25/ai-wrote-a-road-trip-novel-is-it-a-good-read>. Accessed 20 Dec. 2019.
- Huntington, Samuel P. *The Clash of Civilizations and the Remaking of World Order*. NY: Simon & Schuster, 2011.
- . "The Clash of Civilizations?" (1993). *The Clash of Civilizations? The Debate*. NY: Foreign Affairs, 1996.
- Iba, Hitoshi. *Evolutionary Approach to Machine Learning and Deep Neural Networks: Neuro-Evolution and Gene Regulatory Networks*. Springer, E-Book, 2018.

- Ibn-Tufail, Muhammad Ibn-‘Abd-al-Malik. Hayy Ben Yaqdhân: Texte arabe avec les variantes des manuscrits et de plusieurs éditions et traduction française. Ed. Léon Gauthier. Beyrouth: Impr. Catholique, 1936.
- Ickstadt, Heinz. “‘Asynchronous Messaging’: The Multiple Functions of Richard Powers’ Fictions.” *Ideas of Order: Narrative Patterns in the Novels of Richard Powers*. Ed. Antje Kley and Jan D. Kucharzewski. Heidelberg: Universitätsverlag Winter, 2012.
- “Icons of Sound: Cappella Romana in a Virtual Hagia Sophia–Prokeimenon. From California to Constantinople.” *Stanford Live Performance in Bing Concert Hall. Center for Computer Research in Music and Acoustics (CCRMA) and the Art and Art History Department at Stanford University*, 6 Feb. 2013. <https://ccrma.stanford.edu/groups/iconsofsound/performances-recordings>. Accessed 7 Apr. 2020.
- Institute for Media Innovation. Nanyang Technological University, Singapore. “Nadine Social Robot.” n.d. <https://imi.ntu.edu.sg/IMIREsearch/ResearchAreas/Pages/NadineSocialRobot.aspx>. Accessed 2 June 2020.
- Isaacson, Walter. “The Real Leadership Lessons of Steve Jobs.” *Harvard Business Review*, 1 Apr. 2012. <https://www.hbr.org>. Accessed 22 Feb. 2019.
- James, William. “What is an Emotion?” *Mind*, vol. 9, no. 34, 1884, pp. 188–205. Permalink: <http://www.jstor.org/stable/2246769>. Accessed 22 Aug. 2016.
- Jewell, Catherine. “Bringing AI to Life.” *WIPO Magazine*, Sep. 2018. https://www.wipo.int/wipo_magazine/en/2018/05/article_0003.html. Accessed 16 Oct. 2019.
- Jiankui, He. “About Lulu and Nana: Twin Girls Born Healthy after Gene Surgery as Single-cell Embryo.” *The HeLab*, 25 Nov. 2018. <https://www.youtube.com/watch?v=thovnOmFltc>. Accessed 19 Nov. 2019.
- Kirkpatrick, Jeane J. “The Modernizing Imperative: Tradition and Change” (1993). *The Clash of Civilizations? The Debate*. NY: Foreign Affairs, 1996.
- Kramer, Peter D. *Listening to Prozac*. London: Penguin Books, 1997.
- . “The Valorization of Sadness Alienation and the Melancholic Temperament.” *The Hastings Center Report*, vol. 30, no. 2, Mar.–Apr. 2000, pp. 13–18. Permalink: <http://www.jstor.org/stable/3528307>. Accessed 26 June 2017.
- Kurzweil, Ray. *The Singularity Is Near*. NY: Penguin Books, 2005.

- Kuznetsov, Andrei Blokhin and Georgy. *Blocked Content*. Recycle Group, Russian Pavilion, Giardini, Venice, Italy. 57th Venice Art Biennale 2017, "Viva Arte Viva." Installation.
- Larkin, Margaret. "Al-Jurjani's Theory of Discourse." *Journal of Comparative Poetics*, no. 2, Spring 1982, pp. 76–86. Permalink: <http://www.jstor.org/stable/521739>. Accessed 10 Sept. 2014.
- . "The Inimitability of the Qur'an: Two Perspectives." *Religion & Literature*, vol. 20, no. 1, Spring 1988, pp. 31–47. Permalink: <http://www.jstor.org/stable/40059365>. Accessed 10 Sept. 2014.
- Latour, Bruno. "Powers of the Facsimile: A Turing Test on Science and Literature." *Intersections: Essays on Richard Powers*. Ed. Stephen J. Burn and Peter Dempsey. Champaign/London: Dalkey Archive Press, 2008.
- Latour, Bruno. "What is iconoclasm? Or is there a World beyond the Image Wars?" *iconoclasm: Beyond the Image Wars in Science, Religion, and Art*. Ed. Bruno Latour and Peter Weibel. Karlsruhe/Massachusetts: ZKM/MIT Press, 2002, pp. 14–38.
- Laws, Glynis and Amanda Hall. "Research Report: Early Hearing Loss and Language Abilities in Children with Down Syndrome." *International Journal of Language & Communication Disorders*, May–June 2014, pp. 333–342.
- "Learning Hub South—The Hive." Nanyang Technological University, Singapore, 21 Nov. 2019. Personal Visit.
- LeClair, Tom. *In the Loop: Don DeLillo and the Systems Novel*. Urbana/Chicago: U of Illinois P, 1987.
- Lesch, Klaus Peter. "Gene-Environment Interaction and the Genetics of Depression." *J Psychiatry Neurosci*, vol. 29, no. 3, May 2004, pp. 174–184. PMID: <https://www.ncbi.nlm.nih.gov/pubmed/15173894>. PMCID:PMC400687. Accessed 12 Sept. 2017.
- Lynn, White Jr. "Eilmer of Malmesbury, an Eleventh Century Aviator: A Case Study of Technological Innovation, Its Context and Tradition." *Technology and Culture*, vol. 2, no. 2, Spring 1961, pp. 97–111. DOI: <https://doi.org/10.2307/3101411>. Accessed 13 Dec. 2018.
- Ma, Minhua, Zheng Huiru, and Harjinder Lallie. "Virtual Reality and 3D Animation in Forensic Visualization." *J Forensic Sci*, vol. 55, no. 5, Sept. 2010, pp. 1227–1231. DOI: <https://doi.org/10.1111/j.1556-4029.2010.01453.x>. Accessed 9 Jan. 2020.

- Mendelson, Edward. "Encyclopedic Narrative: From Dante to Pynchon." *MLN, Comparative Literature*, vol. 91, no. 6, 1976, pp. 1267-1275. Permalink: <https://www.jstor.org/stable/2907136>. Accessed 25 Feb. 2021.
- Menninghaus, Winfried, et al. "Towards a Psychological Construct of Being Moved." *PLoS ONE*, vol. 10, no. 6, 4 June 2015. DOI: <https://doi.org/10.1371/journal.pone.0128451>. Accessed 23 Jan. 2017.
- Michod, Alec. "An Interview with Richard Powers: 'The Brain is the Ultimate Storytelling Machine, and Consciousness is the Ultimate Story.'" *The Believer Magazine*, 1 Feb. 2007. <https://believermag.com/an-interview-with-richard-powers/>. Accessed 12 Jan. 2014.
- Minsky, Marvin. "Steps Toward Artificial Intelligence." *Proceedings of the IRE*, vol. 49, no. 1, Jan. 1961, pp. 8-30. DOI: <https://doi.org/10.1109/JRPROC.1961.287775>. Accessed 2 Aug. 2019.
- Monette, Connell. "A Mystery of Revelation: 'Caedmon's Hymn' and the Qur'an 96: 1-5." *Comparative Islamic Studies (online)*, 2010: 131-146. DOI: <https://doi.org/10.1558/cis.v4i4.1-4.2.131>. Accessed 12 Sept. 2014.
- Netton, Ian Richard. "Towards a Modern Tafsr of Srat al-Kahf: Structure and Semiotics." *Journal of Qur'anic Studies*, vol. 2, no. 1, 2000, pp. 67-87. Permalink: <http://www.jstor.org/stable/25727972>. Accessed 11 Sept. 2014.
- Novotny, Fritz. "Reflections on a Drawing by Van Gogh." *The Art Bulletin*, vol. 35, no. 1, Mar. 1953, pp. 35-43. DOI: <https://doi.org/10.2307/3047458>. Accessed 4 May 2020.
- Huh, Jina, et al. "Health Vlogs as Social Support for Chronic Illness Management." *ACM Transactions by Computer-Human Interaction. PMC Public Access*, no. 23, Aug. 2014. DOI: <https://doi.org/10.1145/2630067>. Accessed 7 May 2020.
- Oaks, Dumbarton. "Hagia Sophia's Hidden History." 28 Nov. 2018. <https://www.doaks.org/newsletter/hagia-sophias-hidden-history>. Accessed 16 Apr. 2020.
- "Omnimax Theatre Tribute (Original Intro)." 1 Mar. 2014. <https://www.youtube.com/watch?v=AOIuLIIZmFo>. Accessed 24 Jan. 2020.
- Ott, Claudia. "Abenteuer Tausendundeine Nacht." U of Munich, 2020. Talk. *Oxford Learner's Dictionaries*. 2018. <https://www.oxfordlearnersdictionaries.com/>. Accessed 17 Dec. 2018.

- Pappalardo, Joe. "Short-Term Superhuman: If We Create Augmented Soldiers, Can We Turn Them Back? How the Need to Reverse the Effects on Augmented Soldiers Might Drive the Future of Military Tech." *Popular Mechanics*, 25 Sept. 2018. <https://www.popularmechanics.com/military/research/a23457329/augmented-super-soldiers-reversible/>. Accessed 25 Oct. 2018.
- Pellegrin, Jean-Yves. "‘Only the Conversation Matters’—An Interview with Richard Powers." *European Journal of American Studies*, vol. 2, no. 1, Spring 2007. DOI: <https://doi.org/10.4000/ejas.1145>. Accessed 8 Aug. 2014.
- Pentcheva, Bissera V. *Hagia Sophia: Sound, Space, and Spirit in Byzantium*. U Park, Pennsylvania: The Pennsylvania State UP, 2017.
- . "The Voice of Hagia Sophia." Ed. *Duygu Erucman Stanfordlive*, 24 Oct. 2016. <https://live.stanford.edu/calendar/november-2016/icons-sound-hagia-sophia-reimagined>. Accessed 7 Apr. 2020.
- "Personal Trial of VR Set of a Munich Hotel Full-Scale Model." Creativity Night Event. Hochschule Fernsehen und Film, Munich, 7 Mar. 2020. Exhibition. Personal Visit.
- Pinker, Steven. *How the Mind Works*. NY/London: W. W. Norton & Company, 2009.
- Plato. *Republic*. NY: Barnes & Noble Classics, 2004.
- "PlayArt by Ed Tannenbaum (Recollections 2)." *PlayArt11*, 10 Oct. 2010. <https://www.youtube.com/watch?v=I9sJhiFo2wA>. Accessed 24 Jan. 2020.
- "PlayArt by Ed Tannenbaum (Recollections 3)." *PlayArt11*, 10 Oct. 2010. <https://www.youtube.com/watch?v=-iIZVqXsNj8>. Accessed 24 Jan. 2020.
- Ploog, Detlev W. "The Place of the Triune Brain in Psychiatry." *Psychology & Behavior*, 2003, pp. 487–493. DOI: [https://doi.org/10.1016/S0031-9384\(03\)00154-9](https://doi.org/10.1016/S0031-9384(03)00154-9). Accessed 28 May 2018.
- Polišenská, Kamila and Svetlana Kapalková. "Language Profiles in Children with Down Syndrome and Children with Language Impairment: Implications for Early Intervention." *Research in Development Disabilities*, 2014, pp. 373–382.
- Portugali, Juval. *Complexity, Cognition and the City*. Berlin/Heidelberg: Springer-Verlag, 2011.

- Powell, Russell and Allen Buchanan. "Breaking Evolution's Chains: The Prospect of Deliberate Genetic Modification in Humans." *Journal of Medicine and Philosophy*, vol. 36, 12 Jan. 2011, pp. 6–27. DOI: <https://doi.org/10.1093/jmp/jhq057>. Accessed 24 Mar. 2017.
- Powell, Russell. "The Evolutionary Biological Implications of Human Genetic Engineering." *Journal of Medicine and Philosophy*, vol. 37, 2012, pp. 204–225. DOI: <https://doi.org/10.1093/jmp/jhq004>. Accessed 19 Sept. 2017.
- . "The Future of Human Evolution." *Brit J. Phil. Sci.*, vol. 63, 2012, pp. 145–175. DOI: <https://doi.org/10.1093/bjps/axr027>. Accessed 23 Mar. 2017.
- Powers, Richard. *An Interview with Richard Powers*. Jim Neilson. 2010. Accessed 7 Aug. 2014.
- . *Galatea 2.2*. NY: Picador, 1995.
- . *Generosity: An Enhancement*. NY: Picador, 2009.
- . "Home: A Conversation with Richard Powers and Tom LeClair." Scott Hermanson. *Electronic Book Review*, 9 Mar. 2008. <https://electronicbookreview.com/essay/home-a-conversation-with-richard-powers-and-tom-leclair/>. Accessed 24 Aug. 2014.
- . "How to Speak a Book." *The New York Times*, 7 Jan. 2007. <https://www.nytimes.com/2007/01/07/books/review/Powers2.t.html>. Accessed 1 Dec. 2014.
- . "Making the Rounds." *Intersections: Essays on Richard Powers*. Ed. Stephen J. Burn and Peter Dempsey. Champaign/London: Dalkey Archive Press, 2008.
- . *Plowing the Dark*. London: Vintage, 2002.
- . *Studio 360 Audio Interview with Kurt Andersen, October 23, 2009, with a Focus on Generosity* Kurt Anderson. 23 Oct. 2009. <https://www.pri.org/stories/2009-10-23/richard-powers-o>. Accessed 7 Aug. 2014.
- . *The Echo Maker*. NY: Picador, 2006.
- "Présidence de la république : "Toast lors du dîner d'état avec le président Tunisien, M. Béji Caid Essebsi." Présidence de la république, 7 Apr. 2015. <https://www.dailymotion.com/video/x2bljee>. Accessed 5 June 2020.
- Puchner, Martin. *The Written World: The Power of Stories to Shape People, History, Civilization*. NY: Random House, 2017.

- Schwartz, Richard Alan. *Encyclopedia of the Persian Gulf War*. Jefferson, North Carolina: McFarland, 2008.
- Secret de musée: Gorges de l'Ardèche, Caverne du Pont d'Arc*. Voice Over Patrick Band. Pixel Commando et Pioucubé, Rhône-Alpes Tourisme, 2015.
- Seher, Dietmar. "Fortschritt: Die Angst vor neuer Technik ist so alt wie Menschheit." *WAZ*, 6 Jan. 2017. <https://www.waz.de/wochenende/die-angst-vor-neuer-technik-ist-so-alt-wie-die-menschheit-id209190935.html?one=true>. Accessed 15 Jan. 2019.
- Shelley, Mary. *Frankenstein*. Oxford/NY: Oxford UP, 2008.
- Shrestha, Sujana, Joyram Chakraborty and Mona A. Mohamed. "A Comparative Pilot Study of Historical Artifacts in a CAVE Automatic Virtual Reality Environment Versus Paper-Based Artifacts." *MobileHCI '16: Proceedings of the 18th International Conference on Human-Computer Interaction with Mobile Devices and Services Adjunct*. Florence, Italy: Association for Computing Machinery, Sept. 2016. DOI: <https://doi.org/10.1145/2957265.2962644>. Accessed 22 Jan. 2020.
- Smith, Bradley. "On Reality and Virtuality: A Study of Time-Spaces in 'Plowing the Dark.'" *Mosaic: An Interdisciplinary Critical Journal*, vol. 42, no. 3, Sept. 2009, pp. 95–108. Permalink: <https://www.jstor.org/stable/44030669>. Accessed 12 Aug. 2014.
- "Sophia Awakens." Written and directed by Stephan Vladimir Bugaj, produced by Joe Care et al., performance by Tómas Lemarquis, and voice by Isabela Charlton, episode 1, *Hanson Robotics*, 26 Nov. 2016. <https://www.youtube.com/watch?v=LguXfHKsaoc>. Accessed 30 Jan. 2017.
- Stevens, Hallam. "China's Win At-All-Costs Approach Suggests It Will Follow Its Own Dangerous Path in Biomedicine." *The Conversation*, 17 Dec. 2018. <https://theconversation.com/chinas-win-at-all-costs-approach-suggests-it-will-follow-its-own-dangerous-path-in-biomedicine-108658>. Accessed 20 Nov. 2020.
- . "Weeding our Algorithmic Gardens." *Public Books*, 7 Aug. 2018. <http://www.publicbooks.org/weeding-our-algorithmic-gardens>. Accessed 19 Nov. 2019.
- Steyerl, Hito. "In Free Fall: A Thought Experiment on Vertical Perspectives." *E-Flux Journal*, Apr. 2011. <https://www.e-flux.com/journal/24/67860/in-free-fall-a-thought-experiment-on-vertical-perspective/>. Accessed 10 Jan. 2020.

- Suárez-Ruiz, Francisco, Xian Zhou and Pham Quang-Cuong. "Can Robots Assemble an Ikea Chair?" *Science Robotics*, vol. 3, 18 Apr. 2008. DOI: <https://doi.org/10.1126/scirobotics.aat6385>. Accessed 29 Nov. 2019.
- Sun Yuan & Peng Yu Studio Provide. Photographs of the Installation "Can't Help Myself" by Sun Yuan & Peng Yu. Provided Upon Personal Request on 26 July 2019. Photographs.
- Tabbi, Joseph and Rone Shavers, ed. *Paper Empire: William Gaddis and the World System*. Tuscaloosa: U of Alabama P, 2007.
- Taussig, Michael. "Mimesis and Alterity." University of Munich, 12 June 2018. Workshop.
- . *Mimesis and Alterity: A Particular History of the Senses*. NY/London: Routledge, 1993.
- . "The Cameleon World." U of Munich, 13 June 2018. Talk.
- Taylor, Mark C. *Rewiring the Real: In Conversation with William Gaddis, Richard Powers, Mark Danielewski, and Don DeLillo*. NY: Columbia UP, 2013.
- Testas, Abdelaziz. "The Roots of Algeria's Religious and Ethnic Violence." *Studies in Conflict and Terrorism*, vol. 25, 2002, pp. 161–183. DOI: <https://doi.org/10.1080/01490380290073176>. Accessed 6 May 2019.
- The Book of the Thousand and One Nights*. Trans. Powys Mathers from the French Translation of J. C. Mardrus. London/NY: Routledge, 1990. Volume I.
- The Book of the Thousand and One Nights*. Trans. Powys Mathers from the French Translation of J. C. Mardrus. London/NY: Routledge, 1990. Volume III.
- "The Gulf War: Is It Really Taking Place?" *The Jean Baudrillard Reader*. Ed. Steven Redhead. Trans. Paul Patton. Edinburgh UP, 2013, pp. 99–121. <https://www.cambridge.org/core/books/jean-baudrillard-reader/gulf-war-is-it-really-taking-place/51D5F04C15F7319AF2E8A2AC5CA53C5A>. Accessed 29 Jan. 2020.
- The Meta Secret: Law of Attraction*. Prod. Mel Gill. n.d.
- Thompson, Mark. "Stormin' Norman," *The Time*, 27 Dec. 2012, pp. 1934–2012. <https://nation.time.com/2012/12/27/stormin-norman-1934-2012/>. Accessed 10 June 2020.

- Tolman, Edward C. "Cognitive Maps in Rats and Men." *Classics in the History of Psychology. The Psychological Review*, vol. 55, no 4, 1948. <http://psychclassics.yorku.ca/Tolman/Maps/maps>. DOI: <https://doi.org/10.1037/h0061626>. Accessed 30 May 2018.
- Toscano, Alberto and Jeff Kinkle. *Cartographies of the Absolute*. Winchester/Washington: Zero Books, 2015.
- Tran, Christian and ARTIS, director. *Caverne du Pont d'Arc: The Replica of the Decorated Cave of Pont d'Arc*. Chantal Perrin and ARTIS.
- Transcendent Man: The Life and Ideas of Ray Kurzweil*. Dir. Barry Ptolemy. US: Docuramafilms, 2011.
- Translation of the meanings of the Noble Qur'ân in the English Language*. Trans. Muhammad Taqî-ud-Dîn al-Hilâlî and Muhammad Muhsin Khân. Madinah: King Fahd Glorious Qur'ân Printing Complex, 1984.
- Turing, Alan M. "Computing Machinery and Intelligence." *Mind*, vol. 49, 1950, pp. 433–460. DOI: <https://doi.org/10.1093/mind/LIX.236.433>. Accessed 15 Nov. 2018.
- University of Illinois: Beckman Institute for Advanced Science & Technology*. 2014. <https://beckman.illinois.edu/>. Accessed 15 Dec. 2014.
- University of Illinois: Beckman Institute for Science & Technology*. 2020. <https://beckman.illinois.edu/>. Accessed 02 Apr. 2020.
- Vepa, Ranjan. *Biomimetic Robotics: Mechanisms and Control*. NY: Cambridge UP, 2009.
- "Virtual Reality Cabin Design at Airbus." *AircraftInteriorsInt*, 21 June 2016. <https://www.youtube.com/watch?v=GxtNlh5kDVw>. Accessed 24 Jan. 2020.
- "Virtual Reality: Wearn Lecture Featuring Carolina Cruz-Neira, Ph.D." *Davidson College*. 27 Nov. 2017. Lecture. <https://www.youtube.com/watch?v=tHJdhPYngwc>. Accessed 24 Jan. 2020.
- Walsh, Alistair. "Saudi Arabia Grants Citizenship to Robot Sophia." *DW*, 28 Oct. 2017. <https://p.dw.com/p/2mfdU>. Accessed 23 Oct. 2019.
- "Watch How an IMAX Theater aim Enhanced." *E Manic*, 16 Oct. 2013. <https://www.youtube.com/watch?v=iOzyJVehc2Y>. Accessed 24 Jan. 2020.
- Weibel, Peter. "An End to the 'End of Art'? On the Iconoclasm of Modern Art." *iconoclasm: Beyond the Image Wars in Science, Religion, and Art*. Ed. Bruno Latour and Peter Weibel. Karlsruhe/Massachusetts: ZKM/MIT Press, 2002, pp. 586–684.

- . “On the Impact of the Computer on Society.” *Science*, vol. 176, no. 4035, 12 May 1972, pp. 609–614. Permalink: <https://www.jstor.org/stable/1734465>. Accessed 24 Oct. 2019.
- Williams, Jeffrey J. “The Last Generalist: An Interview with Richard Powers.” *Minnesota Review*, no. 52–54, Fall 2001, pp. 95–114. *Project MUSE*. <https://muse.jhu.edu/article/438876>. Accessed 8 Aug. 2014.
- Youssef, Olfa. *The Perplexity of a Muslim Woman: Over Inheritance, Marriage, and Homosexuality*. Introduction. Trans. Lamia Benyoussef. London/NY: Lexington Books, 2017.
- Yu, Sun Yuan & Peng. “Can’t Help Myself.” *58th Venice Biennale: Giardini 2*, 2019. <https://universes.art/en/venice-biennale/2019/tour-giardini-2/sun-yuan-peng-yu>. Accessed 13 May 2020.
- Yu, Sun Yuan & Peng. *Can’t Help Myself*. Central Pavilion, Giardini, Venice, Italy. 58th Venice Art Biennale 2019, “May you Live in Interesting Times.” Installation.
- Žižek, Slavoj. “Iraq’s False Promises.” *Foreign Policy*, no. 140, Jan–Feb 2004, pp. 42–49. Permalink: <https://www.jstor.org/stable/4147518>. Accessed 15 May 2019.
- . “The Parallax View.” *New Left Review*, vol. 25, Jan–Feb 2004, pp. 121–134. <https://newleftreview-10org-100841bb501f9.emedia1.bsb-muenchen.de/issues/ii25/articles/slavoj-zizek-the-parallax-view>. Accessed 29 June 2021.
- . *Welcome to the Desert of the Real! Five Essays on September 11 and Related Dates*. London/NY: Verso, 2002.

Personal Interviews

- An, Bo. *A Conversation about Artificial Intelligence and Automated Systems*, Nanyang Technological University, Singapore. Ines Ghalleb. 25 Nov. 2019. Personal Interview.
- Justin, Dauwels. *A Conversation about Autonomous Vehicles, Real-time Data Processing, Multi-modal Simulation and Neural and Signal Processing*, Nanyang Technological University, Singapore. Ines Ghalleb. 27 Nov. 2019. Personal Interview.
- Powers, Richard. *Conversations about Plowing the Dark, The Echo Maker, Generosity: An Enhancement*. Ines Ghalleb. Urbana-Champaign, Illinois, 1–3 Sept. 2014. Personal Interview.
- Quang-Cuong, Pham. *A Conversation about Robotic Motion and Precision; and Locomotion and Motor Control in Human Beings*, Nanyang Technological University, Singapore. Ines Ghalleb. 27 Nov. 2019. Personal Interview.
- Stevens, Hallam. *A Conversation about the Future of AI and the Ethics and Hype of Human Genetic Modification*, Nanyang Technological University, Singapore. Ines Ghalleb. 21 Nov. 2019. Personal Interview.

Appendix: A conversation with Richard Powers



Fig. 6 A Conversation with Richard Powers, 2014, Urbana-Champaign, Illinois ©Richard Powers

I visited Urbana-Champaign, Illinois, with the purpose of meeting Richard Powers for a series of three interview sessions from the 1st to the 3rd of September 2014. When I saw Richard for the first time, it involved a sense of familiarity that was not only connected to my excitement to finally meet the author—whose books I read with so much fondness, but also because of both his and Jane Kuntz’s (his wife) warm and friendly welcome. The first conversation took place in a casual setting over lunch at their home. The conversation then continued over the following two days, in a more formal manner, which I recorded at length in audio format. At that time, my focus was on *Plowing the Dark*, *The Echo Maker*, and *Generosity: An Enhancement*. Talking to Powers about his novels was highly intellectually engaging, as well as enriching and complementary to the reading of his complex narratives. The following is an abridged version of the transcript, extracted from the

two fully recorded interview sessions, or better said, my conversations with Richard Powers.

Ines: First of all, thank you again, Richard, for your time and for the non-virtual interviews. Let me begin with a more general question, concerning the titles of your books, which are usually both mysterious and inviting to explore. What is the importance of titles in your novels and are they part of the narrative?

Richard: They certainly are part of the narrative. They provide a special kind of emphatic frame for starting out a story, but they also supply a motif, a pedal point, or recurrent thread for the reader as he or she reads through the book and continues to re-reference the title and wonder how it fits with the narrative and the themes at hand. There's a marvelous formulation by Peter Brooks in the book *Reading for the Plot*; he says that there is a strange logic to reading and that we read in anticipation of retrospection. Every word that we read, we read at face value while also anticipating that, at some point in the future, the words that we are reading right now will mean something else. We take them for what they are, but we are also waiting for that moment when what they are becomes something new, and that is especially true with a title. You have the title before you have anything in the book. It could be, as you say, a little riddle or a gnomic code of some kind, and you do not quite know what to do with these few words. They are resonant, they are poetic, but they are not significant in a fixed way. You are not sure what they mean, but as you start the book, you keep thinking back again to the title, and the meaning of the title slowly changes as you go deeper and deeper into the book, and you are constantly adding new associations for how that title might work.

The titles of my individual novels have come to me in different ways, and the books have changed their titles, of course, as you would expect during the act of composition. In some of them, the title was clear long before the book was there; it never changed and never became anything else. But there were other books where I had a vague title prior to knowing what the story was about, or I had a story without a title. I had to work with provisional titles or even discard what I thought was a definitive title.

“Plowing the Dark” was a strange phrase that has been with me since before I was a novelist. Before I was a novelist, I wrote a great deal of poetry and thought that I would be a poet. This idea of a plowshare or a prow of a ship going through darkness, and having the darkness be the matter that was tilled and cultivated was very resonant to me, but I didn’t know how to move forward with it. It was one of these things that I tucked away in my notebook as an evocative turn of phrase to be used later. And actually, it was something that I used as a provisional title for a previous book, *Gain*, until I realized there was a better word that could function in this ever-changing way for my story about capitalism and the history of business. I think that my desire to use this title probably predisposed me toward being especially attentive to an opportunity to use something that had this sense of setting out into the unknown—or turning an abstract quality into a material thing—so that when I had my first experience of immersive virtual reality, I thought: this is what VR is doing, in a way. It takes mere sensation and a trick of perception—encoded as simple numeric data structures—and turns them into the semblance of things. So the multiple meaning that I had for this phrase—the strangeness of existence, a kind of journey into the unknown, but also this relationship between sensation and matter, idea and stuff—all that seemed to be wrapped up in those three words. I thought: I have finally found the book that I can match this phrase to.

Ines: In *Plowing the Dark*, the virtual reality machines of the Cavern project in the Realization Lab are named after painters, ranging from different movements of the visual art. What end does this combination of styles serve?

Richard: I want to make sure that I do not impose my privileged reading of these things on you or on anyone else, because once an artwork has been created, all the associations that an allusive or an intertextual style present should remain active processes.

What is interesting, if you look at the list of artists and movements that the book references, and you try to visualize the actual styles of these practitioners, is the huge diversity of approaches to the medium and the stylistic conventions for representation. In a sense, I chose

painters who, in radically different directions, use colored pigment on a planar surface to do something to this active process between the eye and the brain so that, stylistically, they radically emphasize some element of this conversation between perception and interpretation. If you take one work of visual art from each of these practitioners and set them alongside one another, you would be astonished at how the same species would consider all of these to be “representational” in some strange way. What these different painters highlight is the hugely arbitrary nature of visual representational convention, and they also emphasize the huge restlessness of humankind in searching for new and fresh ways to produce those representations.

The spectrum of cognitive functioning from the intact to the impaired says something about the inescapable mediation of biology in the ways that humans understand the world. This novel, similarly, sets up a whole spectrum of practitioners as somehow the genies inside black boxes, who are involved in different kinds of virtual reality mediation. One practitioner reduces the plane to almost monochromatic and bounded geometrical shapes, another practitioner uses a wispy, thin brush stroke to create complex, three-dimensional modeling. Both these humans are trying to mediate between the “in-here” and the “out-there”. The book uses the most bewildering array of stylistic approaches to say something about the way that the eye actively makes reality. Reality is not some process that comes from the outside and dictates to us how it is to be read or interpreted. Decoding the world is always an active process, operating through the medium of made things.

Ines: In the way you put it, it tends more towards a reading of possible mind workings and plurality, rather than pinning down a message. It functions within the proliferation of meaning, instead.

Richard: Yes. In the active process of making worlds, the mind turns outwards. Thought turns accountable to the substantial challenges to perception that the world presents. In other words, it is always plural and multiple. This book (*Plowing the Dark*) is about what happens to the mind when it cannot get out of the locked room—when that reciprocal relationship between the “out-there” and the “in-here” splits—and

you are left inside the struggle against the “in-here,” as happens with Taimur in his extreme solitary confinement.

Ines: *Plowing the Dark* reads as a three-dimensional novel. How does the narrative achieve this effect?

Richard: I am reminded of the beginning of my career when I wrote *Three Farmers on their Way to a Dance*. That book spun out of a single, real-world photograph. The book uses, as one of its motivic threads, the notion of the stereoscope. By placing two slightly different photographs next to each other, you can trick the parallax of the eyes into reproducing the third dimension in order to resolve the slight difference in perspective between those two images. That certainly comes back into *Plowing the Dark*, this idea that we are constantly taking in a huge amount of data and putting it into these flat maps in our neural structures. However, somehow in the process of integrating conflicting sets of data into a single representational structure, you require a third dimension in order to resolve them, to make sense of them, and to get them to cohere.

Ines: Do you intend the 3D narrative to induce specific workings in the brain?

Richard: That is the goal! The goal, as we were talking yesterday, at lunch, is to allow the reader that passive indulgence, which people love so much when they read, to take the narrative representation as if it were a real thing, and at the same time, to live in it as if the book were a daydream in the reader's head. Yet the books also have these other mechanisms—structural and intellectual—that constantly subvert and disrupt that acquiescent or immersive quality and warn: “Not so fast! Be aware that this, too, is an artifice.” When I depict Adie using digital bits to create an art that makes you dizzy, or when I describe Taimur, who has to build his life back up in the total absence of perceptual stimulation, you too are triangulating and using parallax to make sense of two stories and put them together into a coherent whole.

You cannot read a book like this without casting that recursive glance back at your own mental processes as you follow that narrative. That's why some kinds of readers resist books like this, because the daydream is constantly being interrupted. That interruption is like the torture of Taimur's confinement. This book is constantly thwarting that kind of immersion in the story and pushing you back into cortical or cerebral relationship with the material. It says, look at yourself as you look at this thing!

In this book, there is a third narrative frame that is just as persistent—the shorter chapters. But they operate entirely differently, flowing against the narrative. Every time the implied narrator comes out and begins: “In the economics room...,” or “In the jungle room...,” we are not in the story intradiegetically anymore. We are in a cognitive space, with a different narrator, set inside a different narrative frame. That third frame is focalized neither through Adie, nor through Taimur. There is no focalizing, it is only the implied narrator. You have to take that narrative frame seriously, for the book to work.

Ines: How does Thassa's extreme happiness in *Generosity: An Enhancement* fit within your concept of reality?

Richard: What would it mean to have an unmediated experience of reality? Experience, itself, incorporates this notion of active mediation. Let me go back to the definition of realism as a mimetic process that employs conventions that are familiar enough for a given reader to be able to black-box, or ignore, those conventions and imagine that he or she is in some kind of purely non-interpretive representation. So when you ask, “Is Thassa's hyperbolic happiness realistic?”—whether she appears to be statistically normative or aberrant, whether she has gone beyond the plausible into a kind of allegorical realm or some imaginative world—the answer depends entirely upon your relationship to the conventions of narrative realism and your own expectations as a reader.

In *Plowing the Dark*, I try to let readers immerse themselves in the story while constantly yanking them up and pulling them up out of the ocean to make them aware of the medium they are immersed in. A similar thing happens in *Generosity*, regarding Thassa's temperament.

On one page, the reader might say: “Yes, this could be someone real; I know somebody like that, even though she seems a little extreme.” But the next page leaves you feeling, “No wait a minute. She must be an allegory! Even the narrator says that he’s making her up as he goes along!” I want to move readers across the threshold between those two modes of reading so that they are both participants in and observers of their own reading process. I want them to ask the question that you are asking. Is this woman for real? And I want to keep them in an unsteady relationship to that question, without an easy answer. In all these books, the “real” depends on our level of technology and our ability to intervene in and modify the material world.

Ines: As you put it in *Plowing the Dark*, the brain itself is a virtual reality and it projects the future, giving a sense that everything could be possible.

Richard: I also mean that formulation in a slightly more simple minded, almost banal way. I mean, consider how you and I, Ines and Richard, are sitting here and talking. If I were to describe this to an ancient Greek or Carthaginian, saying how you stepped into a plane and flew around the world from Tunisia to Illinois, then came into my house and turned on your little perfect-memory recording machine, the ancient Carthaginian would say, “well, you must be gods then, or total allegories!” So you see, changing technological leverage, interacting with the brain’s completely malleable ability to make projected models of unreal things, constantly changes what we mean by “realistic.” Writing itself is one of our most powerful technologies for changing what we mean by “the real.” And it’s one of the strongest we have for exploring the effects that other technologies have on the brain’s processes.

Ines: In *Plowing the Dark*, you choose characters from different fields of the arts (a painter and a poet) and insert them in the Realization Lab to work on the virtual reality project. Does this render an idea of artistic evolution, in which art has to evolve into another model that is as effective as technology right now?

Richard: Art is a technological endeavor, and every art possesses its own set of affordances and enabling technologies.

Ines: Is that meant as always already technological or that it has to become technological?

Richard: It is always already technological, but it is always already imaginative. But remember that the other half of that chiasmus is also true. There is, in the practice of science, in the processes of technological invention, always a huge component of imaginative artistic projection. The scientist likes to say “No! What we are doing requires us to suppress emotions and wishful thinking and adhere only to “the real.” But in fact, people like Bruno Latour have shown how the production of facts is never separable from emotions, passions, and leaps of wishful thinking. Notice that “fact” and “fabrication” actually come from the same etymological basis: a factum is a made thing.

Some scientists have always feared that, if they admit to these human processes, it would discredit their appeal to objective authority. They worry that if the scientist draws back the curtain and reveals that the wizard is just another human with lots of hopes, fears, and anxieties who is actively producing his facts—that would somehow discredit the ontological basis of truths that should transcend human values. But facts never do exist in the absence of those who must understand, interpret, and apply them! The scientific and artistic imaginations constantly, reciprocally inform each other. You cannot separate the dancer from the dance.

Ines: You take the example of the crane (instead of any other species) in *The Echo Maker*, which becomes symbolic and creates bewilderment. In the novel, you write: “in the morning it is theatre; in the evening, it is more of a religion.” How so?

Richard: In the novel, cranes function as a source of bewilderment and as a challenge to all stories about human exceptionalism. To some extent, the kinship and estrangement between humans and cranes is the prevailing preoccupation of the entire book. What is Capgras syndrome? As a delusion and as an estrangement, it is highly selective.

People who suffer from Capgras syndrome selectively deny the reality of their loved ones—their near of kin or blood relations. The Capgras patient says: “You look like my relative, you act like my relative, and you seem to know everything that my relative does, but you do not *feel* like my relative, so I reject you! You must be an imposter!” The lack of expected emotional intensity itself creates the feeling of estrangement. You see where I am going with this. In a sense, Mark’s estrangement, his failure to recognize his sister as his next of kin—becomes a kind of limit case, an emblem of the estrangement that is affecting the entire human race. We look at this other creature, which is clearly intelligent, clearly loving (cranes form pair bonds that last forever), a creature that navigates the entire world just with this little map in its head—we look at these birds and we say: “They seem to be like us, but I do not recognize them; they are not my kin!” The human race is suffering from Capgras with regard to the rest of creation. We are rejecting the kinship of nature. Now Darwin says: “Believe me! All creatures are your kin.” Creationism says: “No, humans were created separately; nothing is related to us.” Our self-satisfaction, our self-congratulation, has literally blinded us to seeing how intelligent the rest of the creation is.

This work focuses on four novels by the American author Richard Powers that explore the tangled relations between the scientific, technological, cognitive, and civilizational aspects of contemporary life. These novels—*Galatea 2.2*, *Plowing the Dark*, *The Echo Maker*, and *Generosity: An Enhancement*—reveal complex structural elements, highlighting interconnectedness between various interdisciplines.

This study reveals how interdisciplinarity is necessary for the evolution of writing, while it identifies modes of artificial evolution in Powers' novels. Three prominent types of artificial evolution are addressed: human genome engineering, brain malleability, and artificial intelligence. The book tackles civilizational dynamics in the light of clashes of groups with the same identity, as well as terrorism and wars. It examines artistic evolution through "iconoclasm," interweaving virtual environment CAVE-, architecture-, and scripture-like structures. By exploring these aspects, the novels' interdisciplinary structures become visible. This book shows that the interdisciplinary novel is liquescent and multiplanar. Its narrative structures are imprinted with superimposed cross-cultural and interdisciplinary strata. These establish not only interconnections but also evolutionary *exponential* trends.

The book includes a conversation with Richard Powers.

Ines Ghaleb completed a doctorate in American Studies at the University of Munich, under a DAAD Graduate Scholarship and the GS L&L program during 2016–2020. She participated at the Futures Institute at Dartmouth College. She was a visiting researcher at UC Berkeley and a fellow of the American Council of Young Political Leaders. She is currently co-editing a volume on post-truth. Her research scope covers interdisciplinarity and cross-cultures in American Studies.

43,90 €

ISBN 978-3-487-16069-6



www.olms.de